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Electrical World

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~ABRAHAM LINCOLN~

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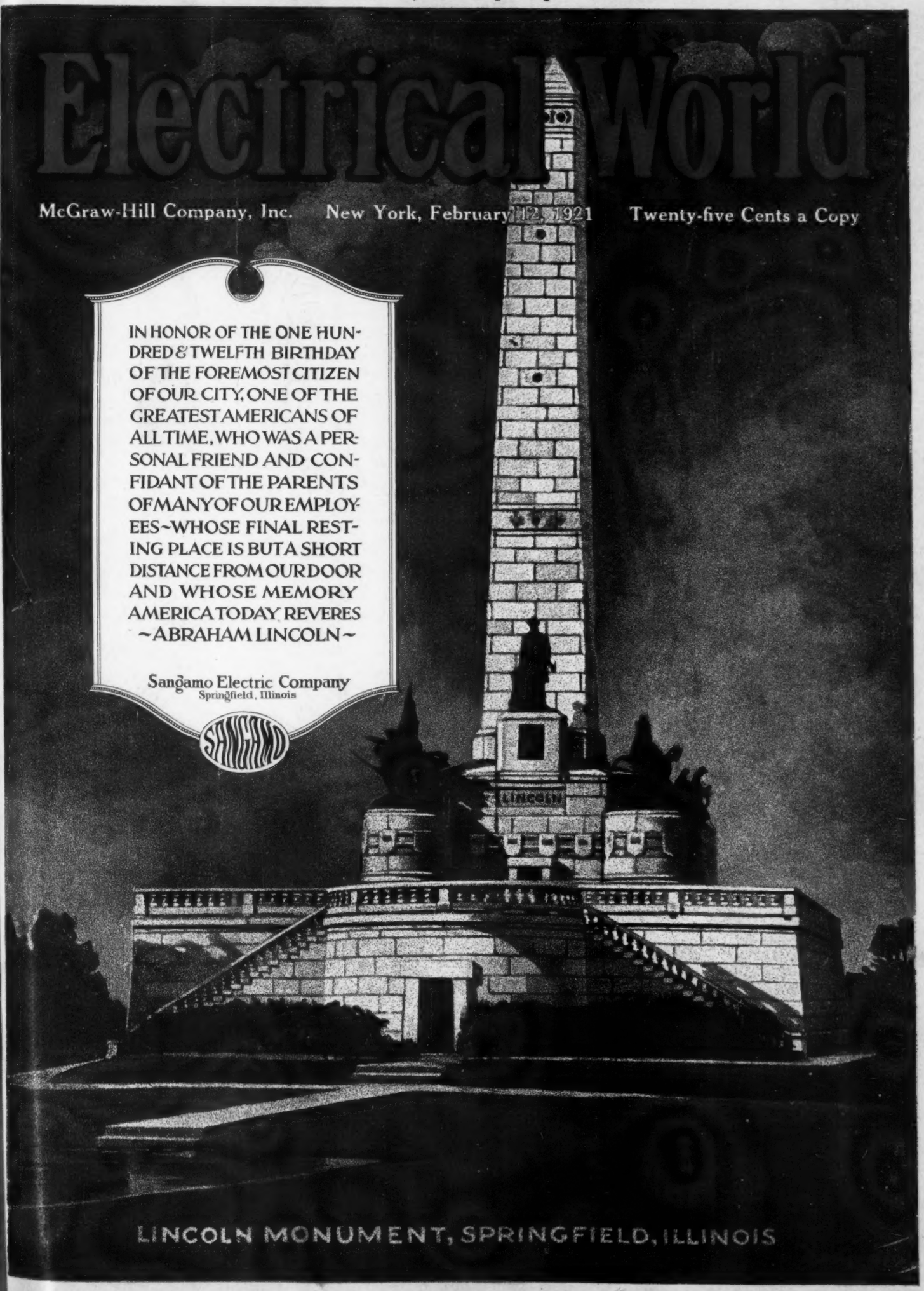

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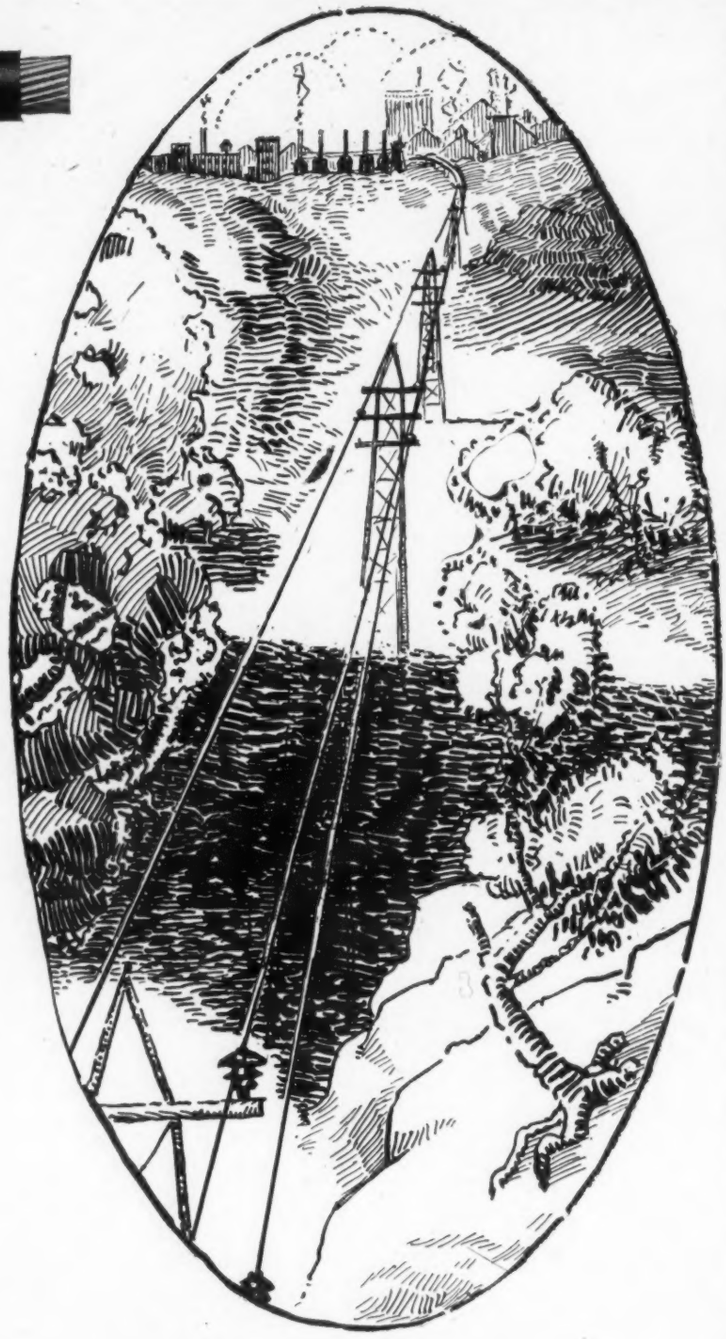

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician
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An Undeserved Reflection on the Electrical Industry

IN ITS anxiety to preserve the public parks of the nation from desecration and vandalism the *Saturday Evening Post*, in a cartoon which appeared in the issue of Jan. 29, has unwittingly departed from its usual good judgment and cast aspersion on the electric light and power industry, which is just as eager to perpetuate and embellish all that is beautiful and useful in nature as is its journalistic critic. Hydro-electric developments may use but they do not destroy or pollute water. We know of no hydro-electric power plant within the national parks except one, and that was placed by the government itself in Yosemite. The plant does not detract from, but rather adds to, the beauty of the park and its enjoyment by tourists. No applications have been made by private interests for power plants within the national parks, and even if any had been made the Federal Power Commission has ruled that no such permits will be granted. Opportunities abound for storing water within the national parks and at the same time adding to their attractiveness. This, however, is neither profanation nor destruction, and we feel that when it was led to include water-power plants in its cartoon the *Saturday Evening Post* was imposed upon. Certainly there is no justification for the inference that the electric light and power industry has harmful designs on the national parks and certainly there is no desire on the part of that industry to go contrary to the wishes of the public.

Efficiency of State Regulation of Utilities Proved

WHAT is wrong with our public service commissions? That is the question which naturally arises in the public mind when increases in rates are granted and when the politician, because of the advances, pillories the utilities and the commissions. That the increases are warranted is not always known; the inference is that the commissions have not been zealous in the public interest. As a result governors have been elected in at least two states, Illinois and Arkansas, on platforms which call for the abolishment of public service commissions. But that commission regulation in either of those states will be done away with we cannot believe. Governors of thirty-four states have gone on record as emphatically approving state regulation of utilities through public service commissions. So satisfactory has been the experience in dealing with public utilities in this way that commissions are now deemed indispensable. In the light of such testimony any movement on the part of the state legislatures of Arkansas and Illinois to dispense with commission regulation would be ill advised. Certainly when the respective legislatures fully consider the matter they will find that in justice to the public and the utilities they must retain the principle of state regulation, even if somewhat modified, rather than return to the more primitive and less satisfactory system of regulation through home rule. State regulation has not been entirely to the liking of public utilities. Commissions have, as a rule, favored the public more than the service companies, so that on the whole as agents of the people they have been effective. We are sure, therefore, that no serious change in Arkansas or Illinois is to be anticipated.

Titles for Industrial Plant Electrical Men

WE BELIEVE a bright future awaits industrial-plant electrical men, those who answer to the nondescript titles of chief electrician, superintendent of electrical department, plant engineer and similar designations. A title may mean much or little to an individual in a particular organization, but in the profession at large titles are indicative of the group status. Looking at the character of its electrical problems of installation and operation, the industrial plant that makes use of say 2,000,000 kw.-hr. and upward annually in its productive processes ranks high among the fields that call for engineers with a fundamental knowledge and experience of electrical work. The time has therefore arrived when the title of industrial electrical engineer should be recognized by the profession and by the industrial employer and awarded to those industrial-plant electrical men professionally qualified and now bearing all sorts of designations. The electrical engineer of today exercises both professional and economic functions, regardless of the particular specialized duties of his occupation, and he merits a title and organization status that will indicate clearly the distinction of the calling.

How Co-operation Has Helped the Electric Vehicle

DURING the past two weeks there was held in the main showroom of the New York Edison Company an exhibition of electric vehicles and accessories. The exhibition was attractive and informative, and it demonstrated what can be done when electric light and power companies and manufacturers of electrical devices get together for a common purpose. In this particular instance the faith which the public utility company has always had in the electric vehicle has been amply demonstrated through works, for during 1920 the number of electric trucks in the community increased almost 500 per cent over the preceding year, largely through its efforts. As a matter of fact, of all the electric trucks now in use in the United States almost one-half are to be found in the metropolitan district of New York City. This wide application is no doubt due first of all to the

inherent economies of the electric vehicle itself in a city like New York, and secondly to the enthusiastic spirit of co-operation which has been manifested by the New York Edison Company to manufacturers of electric vehicles. It indicates clearly the truth of the maxim that "in union there is strength" and shows what might be accomplished in other cities were co-operation carried out as enthusiastically as it is in New York.

A Little More Light on the Cause of Fires

ALTHOUGH we do not desire unnecessarily to harp upon a single string, the matter of the causation of fires, to which we recently referred, seems to involve some peculiarly puzzling statistics that invite comment; for now comes a consulting engineer of the Fire Underwriters' Board and tells the National Brick Manufacturers' Association in annual convention assembled that of $300,000,000 annual fire loss in the United States $70,000,000 is directly due to improperly constructed chimneys.

This amount is dangerously near a quarter of the whole, and beside such a proportion the dangers of electricity, heralded as first in the list of assignable causes, sink into hopeless insignificance. We are beginning to have somewhat of the same feeling about these solemn reckonings that we have regarding the statistics on personal, civic and national losses which are printed in the newspapers from time to time. If summed up—and each total is declared a solemn fact—the amount arrived at would be great enough to pay the expense of the world war and leave something over for the multitudinous "drives" now going on. Quite seriously, statements such as the one we quoted in a previous issue and the one we now quote leave us with grave doubts as to whether the underwriters themselves know or anybody else really knows very much about the cause of fire losses, concerning which they are willing to talk so glibly. The facts may be before them, but there should be a greater degree of agreement in drawing the conclusions than is indicated in the statements we have in hand.

Measurement of Casting Temperatures in the Brass Foundry

THE science and art of pyrometry have made rapid strides in recent years, especially in connection with annealing furnaces. In all of the best annealing processes the temperature and temperature gradient of the product are carefully watched and adjusted. In brass foundries and alloy foundries the same degrees of precision and quantitative technique have not been generally attained, but it is only a question of time when all important foundry furnaces shall have adopted pyrometric methods as a matter of regular routine.

A paper read before the last annual meeting of the Institution of British Foundrymen and referred to in our Digest section drew attention to the importance of careful pyrometry in non-ferrous foundry work. It pointed out that slag and vapors on the surface of the molten material interfered with the precision of radiation pyrometers and of optical pyrometers. It therefore emphasized the necessity of using immersion pyrometers in the crucibles. A thermo-electric couple of nickel and nickel-chromium alloy was recommended for this purpose. Such a junction is stated to generate an emf. of 40 millivolts at 1,000 deg. C., thus enabling robust millivoltmeters to be used as temperature indicators.

As an indication of the importance of measuring and selecting the proper pouring furnace temperature it is mentioned that in the case of a gun-metal composition having definite components of copper, tin, zinc and lead the tensile strength of the alloy reached a maximum when the temperature of pouring was 1,150 deg. C. At pouring temperatures below 1,050 deg. C. the cast bars became unsound, so that there was only a margin of 100 deg. C. between unserviceable alloy and material of the maximum available strength. Similarly, in the case of a certain manganese brass the range of serviceable pouring temperature was very small. For the soundest castings of this composition it should be 970 deg. C. $\pm$ 20 deg. C.

Shall Telephone and Power Circuits Occupy the Highways?

WHETHER a telephone company can utilize the highway to the exclusion of all but very low-voltage power circuits was the question raised in a recent case before the Public Utilities Commission of Illinois. The right to construct a line along a highway parallel with important toll circuits was originally refused to a power company because its service could be given over another route. Later on the farmers along the highway in question, for a distance of 7 miles, asked for service, and the right was granted the power company to construct a 13,200-volt, three-phase line that would serve not only these consumers but also several small communities, and at the same time to remove a length of line from an awkward position along a nearby railway right-of-way to a highway location that would facilitate operation and improve service to all consumers. On a rehearing the telephone companies attempted to show that a 2,200-volt line along the highway would provide service to the farmers, though it would be necessary to carry a 13,200-volt circuit parallel with the road along a nearby railway right-of-way for a large portion of the distance, with feed-ins at several points, and to make a double transformation, as compared with the use of a single line on the highway. In an order granting the right to build the power line, issued before the recent hearing, the commission said that "while the signal circuits with priority of occupation are entitled to reasonable protection from substantial interference, it does not appear that there is a right on the part of the telephone company to occupy the public highway to the entire exclusion of the electric lines."

The ELECTRICAL WORLD, without presuming to pass judgment on the particular case at issue, believes that in the words quoted the commission has found the fundamental consideration that must govern the use of highways by utilities if the public is to have the maximum of benefit. Any utility using a highway must so order its own affairs that it can live with other users of that highway. If it cannot do this, then it will shut out a part of the service that the public owning the highway is entitled to receive. The interests involved must get together and work out a solution in which each interest will assume a fair share of the burden. Such hearings as the one referred to may settle specific cases, but they cannot settle the fundamental problem. In fact, they may seriously complicate the problem by creating legal precedents that are directly opposed to the right solution

and will cause endless trouble before they are wiped out. Legal precedents are not needed in these cases, and it is high time that the central-station and telephone industries shall adopt a course that will eliminate such controversies and lead toward a mutually satisfactory settlement of the problem on the basis of the greatest possible service to the community with the least cost in money and the least interference with each other's service. Shutting one or the other off the highways may ultimately drive both ultra-sensitive telephone toll and important power transmission circuits to private rights-of-way—a result that would be little short of a calamity in the densely populated sections of the country. The whole field of rural distribution at moderately high voltages, as well as the rights of sensitive telephone toll circuits, is at issue, for without the use of the highways for such voltages as are involved in the case rural distribution and service to the smaller communities will be practicable only in isolated cases.

Increasing the Ratings of Cables

CONSIDERED from the standpoint of insulation alone, the most important properties of a dielectric are specific resistance and dielectric strength. When, however, the question of capacity enters to these must be added specific inductive capacity and dielectric loss. Unfortunately the relative values of these four properties vary among different substances over a wide range. There are no known laws connecting them, and knowledge of one of these properties for a given substance is no indication of the values of the others.

In the process of development of high-voltage equipment dielectric strength has of necessity been the first consideration, owing to its immediate bearing on the question of life. In the case of high-tension cables, therefore, it is natural that the first insulating materials used should have been selected principally from the standpoint of dielectric strength. With increasing experience the importance of temperature as limiting the rating of the cable has led to the study of dielectric losses. It is not surprising, therefore, that there has resulted from research in this field a better selection of insulating material combining the requisite properties of high dielectric strength and relatively lower specific dielectric losses. In his article on ratings of cables in the Jan. 1, 1921, issue of the ELECTRICAL WORLD W. A. Del Mar calls attention to the increased ratings possible owing to this improvement and also by other means.

A further interesting result of recent investigation in this field is the indication that higher voltage ratings are possible by the use of smaller conductors, it being stated that the dielectric strength of impregnated paper is greater in an electric field that dies off rapidly, as near a small wire, than in a field that is comparatively uniform, like that around a large wire. The claim is made with some reserve and should be accepted accordingly. Such a result would be contrary to the indications of a great deal of experience. It is well known that the breakdown of insulation frequently takes place progressively, beginning at one point, resulting in higher stress on the remainder, and so after a time resulting in complete break-through. It may be well, therefore, that the use of a smaller conductor in a cable of given outside diameter would stand in the beginning and perhaps for some time a higher voltage. Nevertheless, the stress on the inner layers is higher, and we should suppose, therefore, that deterioration would begin earlier on these layers than in the case of the larger conductor. It would thus appear that cables built in this way might stand up initially to higher voltages but would probably have a shorter average life. Further results and more definite announcements on the subject will be awaited with interest.

Meeting Engineering Emergencies in Peace Times

WHAT can be done when emergencies have to be met is graphically told in this issue by Lucien Pahin. The subject is a French hydro-electric plant and the use that was made of it during the war. Not only did the engineers operating that plant devise unusual methods of operation and use them successfully, but a remarkable showing was made, besides, in using a large percentage of the total available energy of two streams.

The figures given by Mr. Pahin show unusual diligence in swinging into action and great adaptability in meeting difficult situations. To the French engineers in charge of the work we can express our compliments but hardly our surprise. American contact with them during the war has led us to expect from them such success in their enterprises. The lessons to be derived from reading the article are applicable to times of peace. Peace-time emergencies should be met with equal boldness. The stakes, though not so immediately vital, still have their importance in the progress of the world. In war time emergencies such as those described remove the fear of new methods. Would not the same attitude be beneficial in times of peace?

Standardizing Meter and Service Practice

THAT standardization is applicable to central-station operation in small cities just as well as in large ones is indicated by L. C. Peterman in his article in this issue on "Uniform Service and Meter Wiring." Mr. Peterman gives us the findings and results of a thorough investigation of general practice with regard to service drops and meter installations. He proposes some general regulations that cover the whole range of conditions found in a city of 20,000 people. The information given is sufficient to provide for some standard method of handling all service requirements that may present themselves in such a place. That great convenience and appreciable savings will follow the adoption of these standards can be predicted without fear of false prophecy. However, we can hardly expect all central-station operators to agree with all of Mr. Peterman's suggestions. Opinions in such matters are too varied, partly because the subject as a whole has not received sufficient attention and partly because operating conditions are different in different localities. However, there are thoroughness and soundness in the data given by Mr. Peterman, and they will afford valuable assistance to those who have not had the opportunity or time for a study of this nature. Furthermore, the information can be used as a guide by those who have come to realize that standardization is fundamentally important to successful operation and who are undertaking a similar investigation on which to base standard rules for service and meter installation.

Arthur Edwin Kennelly

A savant of international reputation, a profound mathematician and an analytical engineer-physicist whose development work is a fundamental contribution to the advancement of electrical science

THE influence that such engineer-physicists as Prof. John A. Fleming and Sir William Thomson (Lord Kelvin) have reflected in British science has been reflected by Dr. A. E. Kennelly in this country. For nearly twenty years he has been professor of electrical engineering at Harvard, and for the past six years has, in addition, served in the same capacity at the Massachusetts Institute of Technology and as director of the research division of its electrical engineering department. With a background of a quarter of a century of practical work as an engineer-physicist, during which time he gained national recognition, he brought to his university work a knowledge and experience which have helped to gain for Harvard and the Massachusetts Institute of Technology the high reputation that their electrical engineering departments now enjoy. As a consulting engineer his services are in wide demand by both private corporations and national engineering bodies.

Like many other pioneers in electrical work, Dr. Kennelly was graduated from the telegraph key into larger fields of service. For ten years he served consecutively as assistant electrician of the British Eastern Telegraph Company, chief electrician of a cable-laying steamer and senior ship's electrician. Then he became associated with Thomas A. Edison and was his principal electrical assistant at Orange, N. J., from 1887 to 1894, later becoming consulting electrician to the Edison General Electric Company. From 1894 to 1901 he was a member of Houston & Kennelly, consulting engineers, in Philadelphia.

Dr. Kennelly is a savant in the true sense of the word. While his work has not been spectacular from a popular standpoint, it has been of fundamental importance to engineering research. He is a profound mathematician, an analytical engineer-physicist and a lecturer who has the gift of lending clarity to complex subjects. He has been a prolific author of technical papers and books. His contributions to engineering and scientific literature cover a broad range, and the results of his work are widely quoted by other investigators and authors. His earliest contributions were on subjects connected with cable testing and the development of alternating-current theory and dynamo-electric machinery. On practical subjects his discussions on the calculations of networks, investigations covering the phenomena of skin effect in conductors and determinations of the heating of electrical conductors are classics in technical literature. Among the most notable of his original contributions are his application of hyperbolic functions in the analysis of electrical engineering problems and his formulation of the fundamentals underlying radio telegraphy and telephony. During the world war as civilian liaison officer in the army Signal Corps his opinions and assistance were eagerly sought by high officials of the allied governments on wireless matters and in the co-ordination of scientific methods. He was born at Bombay Dec. 17, 1861, of British parents.

Making Best Use of French Hydro Plant

Originally Designed for Railroad Electrification, Station Was Utilized for War Loads to Alleviate Loss of Coal Mines—How the Station, Line and Substations Were Changed to Get Maximum Utilization of Water

By LUCIEN PAHIN
Pontoise, France

THE capture by the German army of the most important French coal mines resulted in an annual loss of more than 20,000 000 tons of coal, but the use of hydro-electric energy counteracted in a large measure this enormous loss. The hydro-electric station at Soulom, in the Pyrenees, designed and partly built for railway electrifications, was revamped for supply to government war plants. This required a change from single-phase to three-phase generators, as well as some ingenious arrangements of transformers and transmission lines for loads at various voltages. At the same time a curtailed service was maintained on the electrified railways. This arrangement resulted in a maximum utilization of water at the Soulom plant, which is situated at the fork of two mountain streams, the Cauterets River and the Gavarnie River. The plant was erected by the Southern Railway Company of France to furnish energy to the electrified lines in the southern section of its Pyrenean division.

WATER SUPPLY FROM TWO STREAMS AT DIFFERENT HEADS

The design of the plant called for two sections to be established in the same building, one operating at a head of 113 m. (370 ft.), the other operating at a head of 250 m. (820 ft.). In each section three penstocks are connected to three turbines of 3,500 hp. rating. The plant is equipped with six 2,400-kw., single-phase alternators, 6,000 volts, 16⅔ cycles. From this station energy is transmitted, through six 2,400-kw. transformers, at 60,000 volts, on steel towers carrying four aluminum cables and delivered to five substations, where the voltage is lowered to 12,000. In addition to the station equipment described above two small generators are included in each section, each one driven by a 250-hp. turbine. One is the house-service unit generating direct current at 120 volts. The other generates three-phase current at 6,000 volts and 50 cycles for service to the various interests that were deprived of their water power through the installation of this large plant. By August, 1913, the plant was able to deliver half its planned capacity, the low-head section being completed. The work inside of the station was also completed at that time. In October, 1915, the high-head section of the plant was ready for operation. In July, 1914, the only substations in service were those at Lourdes and Tarbes, operating electric trains on the Lourdes-Pierrefitte, Lourdes-Tarbes and Tarbes-Bagnères de Bigorre sections. Some energy was also sold from the Lourdes substation to the tramway company of Bigorre. The other uncompleted stations were at Pau, Montrejeau and Lannenmezan. These were to operate the Montrejeau-Luchon, Lannemezan-Montrejeau and Lannemezan-Arreau sections. At each one of these substations the pressure was to be lowered to 12,000 volts.

When mobilization came in August, 1914, all construction work as well as the running of electric trains was stopped on account of lack of workmen. In December, 1914, electric trains were again operated on some of the electrified sections, while the completion of the high-tension work in the station was rushed. It became evident at that time that, with only a small part of the railroad lines electrified, a large amount of power could be made available for other purposes, the total capacity of the plant being 28,000 hp. at the turbines. Moreover, the two mountain streams are capable of taking care of the total capacity of the station for the greatest part of the year. Under these conditions it was immediately planned to make use of all the available energy for war purposes.

WATER USED MOST EFFECTIVELY FOR MUNITIONS PLANTS

The Minister of Armament, after signing some important contracts with the Société Norvégienne de l'Azote, directed it to install at Soulom a plant for the synthetic production of nitric acid and nitrates. In August, 1916, three single-phase Birkeland-Eyde furnaces were being operated on three-phase energy at 10,000 volts and 50 cycles. In order to do this it had been necessary to replace four of the single-phase generators, two in each section of the plant, with four three-phase, 2,500-kw. generators. An extra switchboard with four panels was installed in the station to handle the voltage regulation, the switches and the paralleling of generators. A special annex to the building was necessary for the housing of the 10,000-volt switches controlled from the switchboard. The three-phase, four-wire system was used, with the fourth wire grounded. Each one of the three furnaces in operation was connected between one phase wire and the fourth wire. A fourth furnace was installed as a spare. The total required energy was 10,000 kw. In four months, August to December, 1916, a total of 15,000,000 kw.-hr. was furnished to these furnaces, while the total output to the railroad company was only 1,500,000 kw.-hr.

In the beginning of 1917 the shortage of coal, and especially the irregular deliveries, made it necessary for the ordnance office at Tarbes to consider the stopping of all electric traction in the sections where it had been kept up in order to insure the ordnance power requirements of 2,000 kw. to 2,500 kw. from the plant at Soulom during the day and of 1,000 kw. during the night. This would have resulted in an expenditure for the railroad company of 12 tons of coal a day to handle its trains by steam in the affected sections. Against this a daily economy of 50 tons of coal by the ordnance plant at Tarbes was obtainable. In order to furnish the required three-phase current at 10,000 volts, 50 cycles, to the ordnance plant, the remaining single-phase alternator in the low-head section of the plant was rewound

for three-phase. This arrangement, leaving one single-phase unit in the high-tension section for railway operation, proved to be the most economical in regard to water.

In order to furnish all available energy for the nitrate plant the storage water was reduced to a minimum. Three-phase energy for the ordnance plant generated at about 9,500 volts was stepped up to about 55,000 volts through three of the original 6,000-volt transformers, star-connected on the low-tension side, and delta-connected on the high-tension side to reduce as much as possible the voltage on the low side. From Soulom to Tarbes three of the four aluminum cables of the railway company were used at 55,000 volts, and there the voltage was stepped down in the same manner that it was stepped up at Soulom.

One Side of 60-Kv. Line Operated Grounded

In order to maintain electric traction on the line from Lourdes to Pierrefitte and on the tramways of Bigorre fed from the substation at Lourdes, which was still found possible, a fifth aluminum cable was installed between Soulom and Lourdes. On account of mechanical and electrical considerations it was found advisable not to install another highly insulated wire in the tower line. This fifth cable was therefore attached by a low-voltage insulator to the body of the tower and grounded at one point of the system. The use of this cable and the fourth aluminum cable previously installed, insulated for 60,000 volts, handled the single-phase current. The only remaining single-phase alternator generating at 6,000 volts was connected to the low-tension side of two of the 2,500-kva. transformers, in series. The high-tension side of these transformers was connected in parallel, thus sending single-phase energy at 30,000 volts to Lourdes over the temporary line. At Lourdes two single-phase transformers of 625 kva. rating reduced the voltage from 30,000 to 12,000.

A similar transformer had its low-tension side connected to two of the cables of the transmission line between Lourdes and Pau. This circuit was not grounded and caused no trouble to telephone or telegraph lines, which had not yet been protected from such disturbances. Practically speaking, the voltages at the same instant on each cable were equal to + 6,000 and — 6,000 with respect to ground and therefore neutralized each other.

Between Lourdes and Tarbes, where a larger load had to be handled, it was necessary to obtain 28,000 volts in a similar manner and transmit by using the fourth cable and the nearest catenary of the traction line. This single-phase energy at 28,000 volts was obtained at the substation at Lourdes through two transformers of 625 kva. each, having their high-tension coils fed in parallel by 30,000 volts from Soulom. The low-tension side was connected in series and grounded. Each one of the transformers used was equipped with several taps which permitted the obtaining of 28,000 volts between cables instead of 24,000 volts.

Two transformers rated at 30,000 volts to 12,000 volts, 625 kva., were installed temporarily at Tarbes and furnished the energy for trains between Tarbes and Bagnères de Bigorre. It was possible here, on account of the taps on the transformers, to furnish the full 12,000 volts to the catenary.

The substation at Lannemezan was also fed with 28,000 volts over two of the cables of the transmission line, and the voltage was stepped down as previously described. Here, by using similar transformer connections to those at Tarbes, the Lannemezan-Arreau section was handled.

Delivery of Energy to the National Powder Plant at Lannemezan

Later the Soulom plant was called upon to furnish power to the national powder plant of Lannemezan. Three of the aluminum cables of the double line between Tarbes and Lannemezan were used for that purpose, and the railroad company had to make use on that line of the fourth cable and the catenary for electric traction in the same way as was done between Lourdes and Tarbes. However, between Tarbes and the Bagnères junction (3 km.), where trains from Tarbes to Bagnères were routed, and over three tunnels between Tarbes and Tournay it was necessary to install a fifth cable.

Some months later the government required the exclusive use of the six 2,500-kva. transformers at the station at Soulom for service to the ordnance plant at Tarbes and the powder plant at Lannemezan. This necessitated transmission at 55,000 volts to Lannemezan, instead of 10,000 volts, and stepping down at that point to 12,000 volts. The only difficulty encountered in this change was the fact that it was necessary to maintain electric traction on the branches of Pierrefitte, Bagnères and Arreau. In order to do this two single-phase transformers of 1,250 kva. capacity were installed in an annex of the plant at Soulom. These two transformers (60,000 volts to 12,000 volts) were connected with their low-tension sides in parallel on the remaining 6,000-volt, single-phase alternator. The two high-tension sides were also connected in parallel and delivered 30,000 volts to the fourth aluminum cable and the fifth temporary cable, this line taking care of the station at Lourdes.

	Kilowatt-Hours		
	1916	1917	1918
Nitrate plant	14,429,365	65,908,800	71,818,600
Small users	38,600	73,000	141,400
Electric traction	3,367,015	2,443,000	2,917,000
Tramways of Bigorre	192,000	244,200	253,000
Ordnance plant and powder plant	.....	6,650,000	8,870,000
Total	18,026,980	75,319,000	84,000,000

Output of the Soulom Plant by Years

The various changes that were made at the plant at Soulom, which was originally built to furnish energy for traction, contributed in no small measure to the furnishing of electrical energy for the national defence of France. In doing this the plant gave continuous service, which was not a condition required in its design. Although there is considerable difference between a hydro-electric plant designed and built for electric traction and one designed for furnishing power to industrial establishments, the plant at Soulom was able to measure up to all requirements placed upon it.

In relieving the condition brought about by the loss of coal mines to the Germans the hydro-electric plants in the Pyrenees did their part. In spite of the unfinished conditions of the plants and in spite of the many temporary arrangements required it was possible to maintain electric traction on the electrified lines and to furnish the rest of the energy available to war plants. The table above shows the amount of energy generated at the plant at Soulom and the use made of it in the years 1916-1918.

The energy furnished to the nitrate plant in 1918, in spite of the slowing up following the armistice, was equivalent to the continuous operation at full load for nearly 7,000 hours of the four generators that were reserved for its service. The amount of energy furnished to the ordnance plant and at the powder plant resulted in continuous operation of the generators at full load for more than 3,000 hours. On the other hand, the energy used for the railroad company and the tramways resulted in continuous operation of the generators at full load for only 1,300 hours. Considering the hydraulic end of the plant, the total output in 1918 corresponded to carrying full load for 7,400 hours, giving a coefficient of utilization equal to 64 per cent. During 1918 84,000,000 kw.-hr. generated at Soulom resulted in a saving of 170,000 tons of coal.

Uniform Service and Meter Wiring

Definite Rules Adopted at Chillicothe, Ohio, for Installing Service — Size of Wire and Meter Fixed by Connected Load—All Except Very Small Customers Are Furnished with Three-Wire Instead of Two-Wire Service

By L. C. PETERMAN

Formerly Electrical Engineer Ohio Utilities Company, Columbus, Ohio

IN CONVERTING its distribution system from 125-cycle, single-phase, to 60-cycle, three-phase, the Chillicothe (Ohio) Electric Railway, Light & Power Company made a rather extended study of the methods of supplying service to the consumer's premises.

Methods employed by representative companies along this line showed a considerable range of standards in existence. Adequate reasons were developed, however, for abandoning the prevailing practice of installing closely spaced transformers of very small size, short two-wire secondaries and two-wire services exclusively, and unprotected service wires inside the building, together with the indiscriminate location of service switch and fuses.

For lighting and small power installations a three-wire, three-phase, 2,300-volt system was decided upon,

TABLE I—METER SIZES FOR SINGLE-PHASE MOTORS

Size	Volts	Wire	Maximum Size, One Motor Hp.	Total, Two or More Motors Hp.
5-amp.	110	2	¼	¾ or smaller
5-amp.	220	3	¾	1½
10-amp.	220	3	1½	3
15-amp.	220	3	3	4
25-amp.	220	3	5	7

with three-wire 110/220-volt lighting secondaries and 220-volt, three-phase transformers for power. For the larger power customers requiring 300 kw. and above, 6,900 volts was supplied at the primary voltage or at 575 volts secondary.

Two-wire services had proved unsatisfactory for most commercial consumers, not only on account of the large copper required for adequate voltage regulation and the attendant strain on poles, pins and house brackets, but also because it had been found almost impossible to eliminate the effect of starting single-phase, 110-volt induction motors of ½ hp. to 1 hp. and larger. On the other hand, universal application of three-wire services to all loads was proved unnecessary, as the numerous 110-volt heating devices in residences, together with frequent lack of proper planning of the interior branch circuits, in many cases resulted in badly unbalanced loading and nullified the advantages ordinarily secured by the use of 220 volts.

Consideration of the voltage drops in service wires as shown in Tables V, VI and VII set the limit of the two-wire service and meter at 5 amp., solely from the standpoint of economy and general efficiency. This was because the alley distribution employed gave an average length of service of about 150 ft. (45 m.) and it was desired to limit the drop in the service to 1 volt. Accordingly tests were made to determine the connected load which would produce a 5-amp. or 0.55-kw. demand. This was found to be about 1,800 watts for residences and about 800 watts for small shops and stores, and as a result two No. 8 wires and a 5-amp. meter are usually recommended for such loads or smaller, and three-wire services of appropriate size for all larger loads.

TABLE II—THREE-PHASE MOTORS, THREE-WIRE, 220 VOLTS

Meter Size, Amp.	Maximum Size One Motor, Hp.	Total Two Motors, Hp.	Total, More than Two, Hp.
5	2	...	...
10	4	5	5½
15	6	7½	8
25	10	15	16
50	20	30	33
75	30	40	50
100	45	60	70
150	60	90	100

NOTE—Small sizes: 1 hp. = 3 amp. per phase (approx.); 15 hp. or above 1 hp. = 2.6 amp. per phase (approximate).

TABLE III—SIZE OF SERVICE WIRES, WEATHERPROOF ONLY, THREE-PHASE

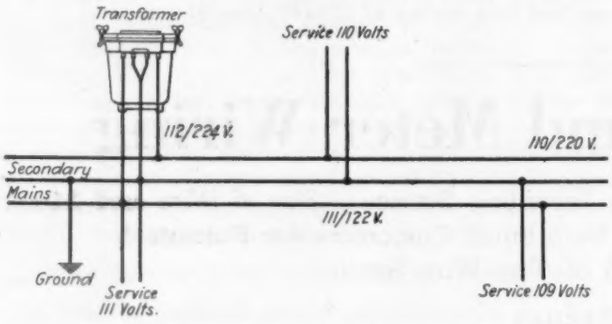
Size, Amp.	Volts	Wire	Length of Service 40-Ft.	80-Ft.	120-Ft.	160-Ft.	200-Ft.
5	220	3	10	10	10	10	10
10	220	3	10	10	10	10	8
15	220	3	10	10	8	8	6
25	220	3	8	8	6	6	4
50	220	3	6	6	4	2	2
75	220	3	4	4	2	1	1/0
100	220	3	2	2	1	1/0	2/0
150	220	3	1	1	1/0	2/0	4/0

Maximum voltage drop allowed: 3 volts for loads up to 100 amp.; 4 volts for 150 amp. load.

For a single large residence having a demand of around 1 kw. a two-wire No. 6 service may be preferable to three No. 8's on account of the unbalance usually encountered, as mentioned above. But for four-family and six-family apartments, the customary two No. 6 wires can profitably be replaced by three No. 8's as the individual two-wire meters can be split across the two sides of the three-wire mains and a fair balance secured.

For such a load of around 2 kw. demand the three No. 8's will greatly reduce the otherwise excessive drop and keep it under 1 volt for virtually all lengths of service.

The maximum voltage drop to be allowed in the secondary proper was set at 2 volts. This permitted a reasonable length of secondary and kept the investment



VOLTAGE CONDITIONS ESTABLISHED AT CHILLICOTHE

per customer at a low figure. Voltage regulation of the primary circuits was arranged as far as possible to give 112 volts at the transformer secondary terminals, resulting in the conditions shown in diagram above.

It will be noted that at the time of peak load on the system, or for about two hours per day, the customers immediately adjacent to the transformer, or about 20 per cent of the total number, will receive 1 volt above the standard of 110 volts, approximately 40 per cent will receive standard voltage and 40 per cent receive a minimum of 1 volt below standard. It is appreciated that some companies, particularly those in the larger

TABLE IV—SIZES OF PRIMARY FUSES

Fuse each leg of single or three-phase transformer installation, as shown below

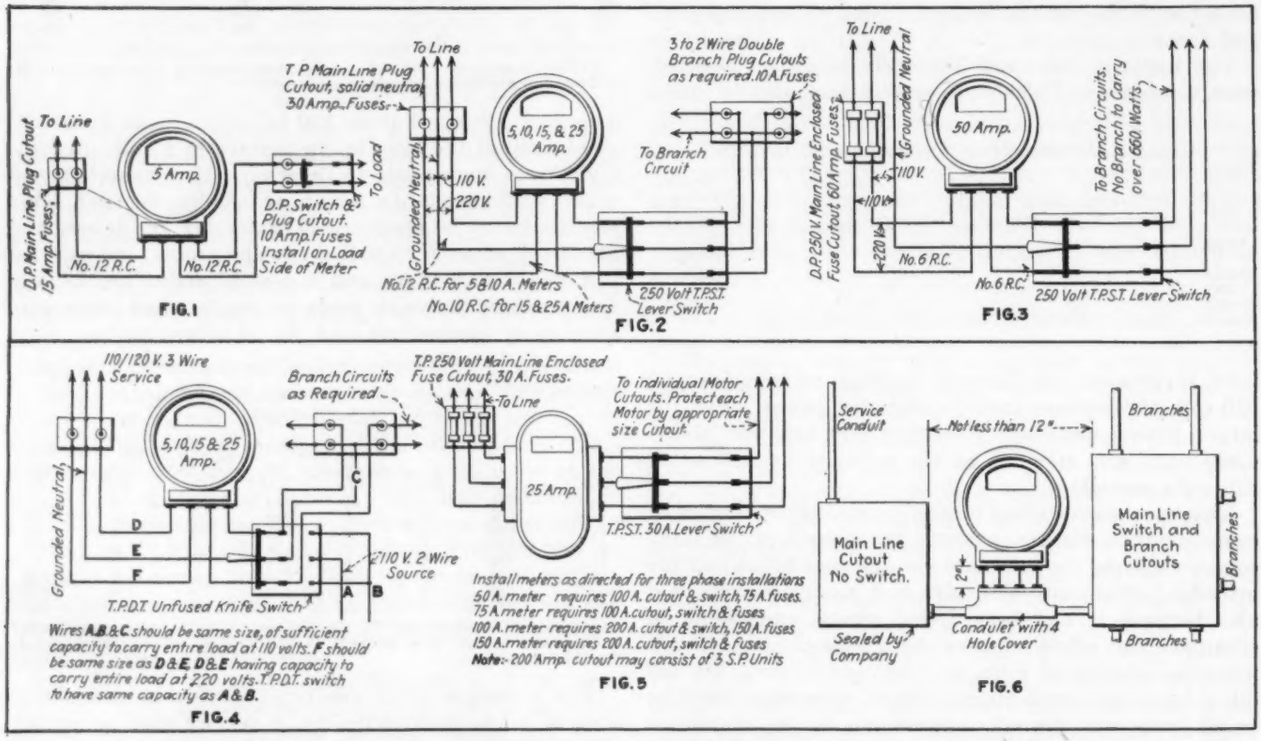
Total Kva.	One-Phase	Three-Phase	Total Kva.	One-Phase	Three-Phase
1	3	3	22.5	20	15
2	3	3	25	25	15
3	3	3	30	30	20
4	5	5	37.5	35	25
5	5	5	45	40	30
7.5	8	6	50	45	35
10	10	8	75	65	50
15	15	10	100	90	65
20	20	15	150	130	90

cities, would consider such regulation as of too great a range. But in the community under discussion, in view of the standards maintained in nearby cities and towns and because of the necessity of keeping the investment at the lowest possible minimum, the voltage regulation decided upon was considered, and has since proved, very satisfactory.

TABLE V—VOLTAGE LOSS* IN 100-FT. CIRCUITS WITH 12-IN. SPACING AND CARRYING 10-AMP. LOAD

Size of Wire, No.	Resistance Drop, (Volts)	Reactance Drop, (Volts)	Impedance Drop, (Volts)	Increase of Impedance Over Resistance
10	1.994	0.2618	2.008	0.007%
8	1.254	0.2514	1.279	2.0
6	0.788	0.2406	0.8213	4.2
4	0.496	0.2300	0.5334	7.5
2	0.312	0.2194	0.3514	12.6
1	0.2474	0.2140	0.2871	16.0
1/0	0.1962	0.2086	0.2359	20.2
2/0	0.1556	0.2034	0.1952	25.4
4/0	0.0978	0.1928	0.1364	39.5

*Voltage loss is the numerical difference between voltage at the supply and receiver ends of the line. If skin effect be computed for No. 4/0, the above figure for resistance drop would become 0.0980, an increase of one-fifth of one per cent.


To Line
D.P. Main Line Plug Cutout
15 Amp. Fuses
5 Amp.
No. 12 R.C.
No. 12 R.C.
D.P. Switch & Plug Cutout. 10 Amp. Fuses Install on Load Side of Meter
To Load
FIG. 1
T.P. Main Line Plug Cutout, solid neutral 30 Amp. Fuses
To Line
5, 10, 15, & 25 Amp.
Grounded Neutral
110 V.
220 V.
3 to 2 Wire Double Branch Plug Cutouts as required. 10 A. Fuses
To Branch Circuit
No. 12 R.C. for 5 & 10 A. Meters
No. 10 R.C. for 15 & 25 A Meters
250 Volt T.P.S.T. Lever Switch
FIG. 2
To Line
Grounded Neutral
D.P. 250 V. Main Line Enclosed Fuse Cutout, 60 Amp. Fuses
50 Amp.
110 V.
220 V.
No. 6 R.C.
No. 6 R.C.
To Branch Circuits. No Branch to Carry over 660 Watts
250 Volt T.P.S.T. Lever Switch
FIG. 3
110/120 V. 3 Wire Service
5, 10, 15 & 25 Amp.
Grounded Neutral
Branch Circuits as Required
C
D
E
F
A
B
T.P.D.T. Unfused Knife Switch
Wires A, B & C should be same size, of sufficient capacity to carry entire load at 110 volts. F should be same size as D & E. D & E having capacity to carry entire load at 220 volts. T.P.D.T. switch to have same capacity as A & B.
FIG. 4
T.P. 250 Volt Main Line Enclosed Fuse Cutout, 30 A. Fuses.
To Line
25 Amp.
To individual Motor Cutouts. Protect each Motor by appropriate size Cutout.
T.P.S.T. 30 A. Lever Switch
110 V. 2 Wire Source
Install meters as directed for three phase installations
50 A. meter requires 100 A. cutout & switch, 75 A. fuses.
75 A. meter requires 100 A. cutout, switch & fuses
100 A. meter requires 200 A. cutout & switch, 150 A. fuses
150 A. meter requires 200 A. cutout, switch & fuses
Note:- 200 Amp. cutout may consist of 3 S.P. Units
FIG. 5
Service Conduit
Not less than 12"
Branches
Main Line Cutout No Switch.
Main Line Switch and Branch Cutouts
Branches
2"
Sealed by Company
Conduit with 4 Hole Cover
Branches
FIG. 6

FIGS. 1 TO 6—SERVICE AND METER INSTALLATIONS ADOPTED FOR STANDARD PRACTICE IN CHILLICOTHE, OHIO

All service meters installed on soft pine board ⅞ in. thick, painted with two coats of black paint, mounted on dry rigid wall. They are located within 4 ft. of point where service wires enter building. Screw shell of cut-out plug connected to meter leads. Fig. 1—Standard metering installation, 110 volts, 5 amp., two-wire, single-phase. Fig. 2—Wiring for 220-volt, 5, 10, 15 and 25-amp., three-wire, single-phase loads. Fig. 3—Arrangement for serving 50-amp. single-phase loads at 220 volts, over three wires. Fig. 4—Three-wire breakdown service supplying energy to 110-volt, two-wire isolated plant. Fig. 5—Standard installation for 220-volt or 440-volt, 25-amp. (and lower) three-wire, three-phase delta service. Fig. 6—Meter board for conduit service entrance and conduit interior wiring. Wiring schemes for this arrangement are shown in Figs. 2, 3 and 4.

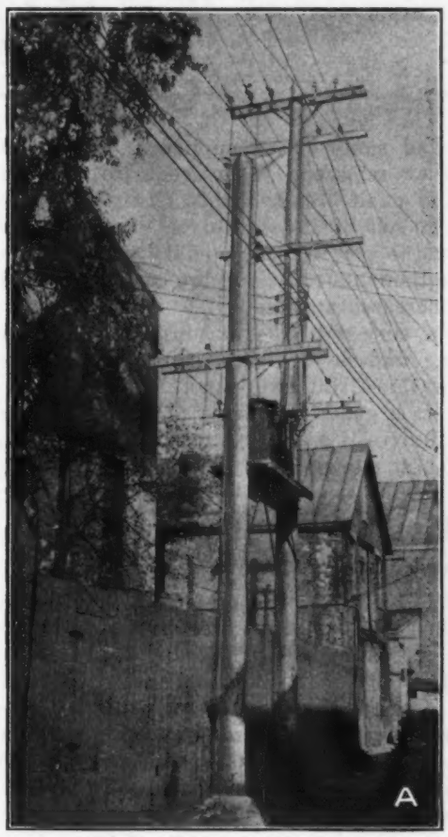
TABLE VI—VOLTAGE LOSS FOR LOAD EQUIVALENT TO CAPACITY OF WIRE (100-FT. SERVICES)

Wire size (B. & S. gage), Number	10	8	6	4	2	1	1/0	2/0	4/0
Capacity in amp	30	50	70	90	125	150	200	225	325
Voltage drop, capacity load, 110-volt, two-wire	6.02	6.40	5.75	4.80	4.39	4.31	4.72	4.39	4.43
Voltage drop, capacity load, 220-volt, three-wire, from neutral to outer	3.01	3.20	2.87	2.40	2.20	2.15	2.36	2.20	2.22

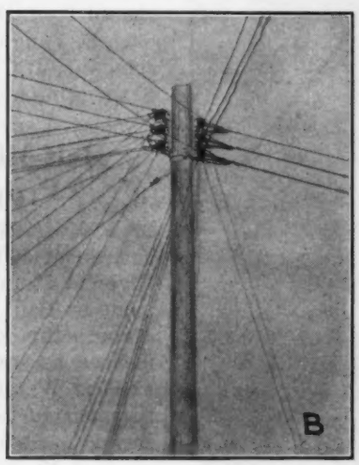
To provide a guide for the installation of services and meters, employees were provided with copies of Table VII, as well as with similar tables covering single-phase and three-phase motor installations. (Tables I, II and III.) Thus the order clerk, having obtained from the inspector the connected load, length of service and

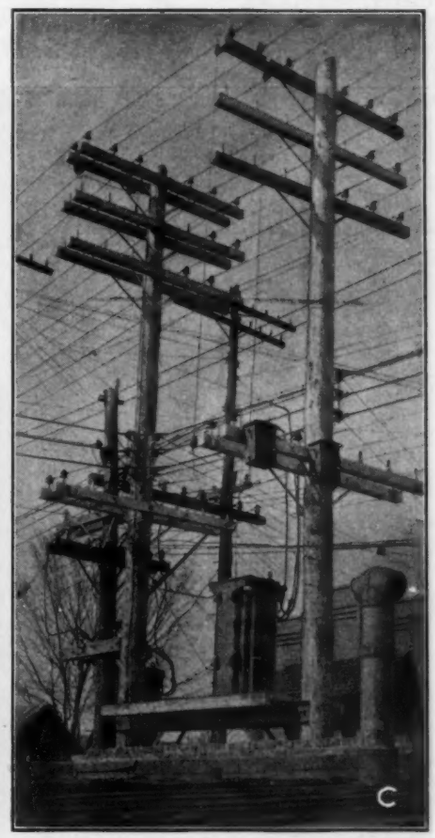
4. For several consumers grouped on the same premises one service only is run for the entire group, individual meters to be centrally located as near the service entrance as possible.

5. Designation of loads requiring two-wire and three-wire services respectively.



TRANSFORMER INSTALLATIONS AND WIRING ON CROWDED POLES. ALL SERVICE WIRES ARE ARRANGED IN A VERTICAL PLANE. SPECIAL CUT-OUT BOXES OR FITTINGS ARE NOT REQUIRED





class of business, is in a position to issue complete orders for connection of the customer. It was felt that this method was preferable to the previous practice, common to many of the smaller companies, of having the line foreman make his own computations, as a saving of time and greater uniformity resulted.

Requirements for Service and Meter Wiring

Specifications were also prepared giving the requirements of the company for service and meter wiring on the consumer's premises. These were approved by the Public Utilities Commission and include:

1. Consumer to purchase and install service entrance conduit, main-line switch, service cut-out and steel cut-out box, and meter wiring.

2. Service wires on the consumer's premises to be installed in rigid iron conduit, main-line cut-out box to be sealed by the company.

3. Meter to be installed wherever possible within 4 ft. (1.2 m.) of service entrance, in which case fuses only are to be installed between meter and supply.

6. All single-phase motors ½ hp. and above to operate only on 220-volt circuits.

Under Rule 1 the company installs only the meter and the weatherproof wires between pole and building. Rule

TABLE VII—SIZE OF METERS AND SERVICE WIRES

Maximum Watts Connected	Class of Service	Size Meter (amp.)	Volts	No. of Wires	Length of Service, Feet 60	80	100	120	140	160	180	200
1,800	Domestic	5	110	2	10	10	10	8	8	8	6	6
4,000	Domestic	5	220	3	8	8	8	8	8	8	8	8
800	Commercial	5	110	2	10	10	10	8	8	8	6	6
1,600	Commercial	5	220	3	10	10	10	10	10	10	10	10
3,000	Commercial	10	220	3	10	10	10	8	8	8	6	6
4,500	Commercial	15	220	3	10	8	8	6	6	6	4	4
8,000	Commercial	25	220	3	8	6	6	4	4	2	2	2
16,000	Commercial	50	220	3	4	4	2	2	1	1/0	1/0	2/0
24,000	Commercial	75	220	3	4	2	1	1/0	1/0	2/0	4/0	4/0
33,000	Commercial	100	220	3	2	2	1	1/0	2/0	2/0	4/0	4/0
50,000	Commercial	150	220	3	1	1/0	2/0	4/0	4/0	...	...	...

* Maximum voltage drop allowed: 1.0 volt for loads up to 50 amp.; 1.1 volts for 50 amp.; 1.25 volts for 75 amp.; 1.5 volts or 100 and 150-amp. load. Loads of 50 amp. and up are almost uniformly near transformer location, hence the total secondary drop is not excessive.

2 helps prevent loss of electrical energy by theft and otherwise. A general inspection had disclosed many cases of one, two or more lights connected ahead of the meter when open wiring was used. One extreme case was found where a 3-hp. motor, connected ahead of the meter, had been in daily operation for a period estimated at upward of fifteen years.

Rule 3 was inspired by the observation that many consumers used the service switch as a master switch for their installation and operated it two or more times a day. Transposing position of the switch prevents frequent interruption of current to the meter shunt, improved accuracy of registration resulting. The main fuses are rated at two to five times the capacity of the meter, depending on the meter size, and are always larger than the largest branch fuses. Overloads therefore usually operate only branch circuit fuses which are

STEEL WALL BRACKETS AND CONDUIT ENTRANCE ARE FEATURES OF CUSTOMER'S SERVICE

readily accessible to the consumer. No objection by the underwriters was made to this practice.

Rule 4, covering apartment houses and business blocks, minimizes investment in service drops and facilitates meter reading and testing. Rule 6 was demanded by requirements of good service. In one case a ¾-hp. coffee-mill motor had caused the installation of a No. 2 service on account of the lights flickering badly on starting. After conversion to 220 volts, three No. 8 wires were substituted and the flicker was less noticeable even than with the two No. 2's. The total load was about 2.2 kw.

At the time of the inauguration of 60-cycle service, Chillicothe was one of the largest towns in the country maintaining 125-cycle service. In view of the special nature of motor-driven apparatus required for operation on the old circuits, it is rather remarkable that in this community of 20,000 people there were found upward

TABLE VIII—VOLTAGE LOSS* AT VARIOUS LOADS FOR 100-FT. SERVICES

110-Volt Service		Size of Wire								
Amp.	Kw.	No. 10	No. 8	No. 6	No. 4	No. 2	No. 1	No. 1/0	No. 2/0	No. 4/0
5	0.55	1.00	0.64	0.41	0.27	....	....	....	....	....
10	1.1	2.00	1.28	0.82	0.53	0.35	0.29	0.24	....	....
15	1.65	3.01	1.92	1.23	0.80	0.53	0.43	0.35	....	....
20	2.2	....	2.56	1.64	1.07	0.70	0.57	0.47	0.39	....
25	2.75	....	3.20	2.05	1.33	0.88	0.72	0.59	0.49	....
30	3.3	....	....	2.46	1.60	1.05	0.86	0.71	0.59	0.41
50	5.5	....	....	4.11	2.67	1.76	1.44	1.18	0.98	0.68
		220-volt, three-wire; drop from neutral to outer								
5	1.1	0.50	0.32	0.21	0.13	....	....	....	....	....
10	2.2	1.00	0.64	0.41	0.27	....	....	....	....	....
15	3.3	1.51	0.96	0.62	0.40	0.26	....	....	....	....
20	4.4	2.01	1.28	0.82	0.53	0.35	0.29	0.24	....	....
25	5.5	....	1.60	1.03	0.67	0.44	0.36	0.29	0.24	....
30	6.6	....	1.92	1.23	0.80	0.53	0.43	0.35	0.29	0.20
50	11.0	....	....	2.05	1.33	0.88	0.72	0.59	0.49	0.34
75	16.5	....	....	....	2.00	1.32	1.08	0.88	0.73	0.51
100	22.0	....	....	....	....	1.76	1.44	1.18	0.98	0.68
150	33.0	....	....	....	....	2.64	2.15	1.77	1.46	1.02

* It should not be overlooked that for equivalent amperage the lower half of the table represents twice the power of the upper part of the table.

of 600 motors and motor-driven appliances which had to be rewound or replaced. This seems to indicate forcibly that the public really wants electrical appliances and will go out of its way to get them. After the change-over the power load quickly jumped from nothing to more than 1,200 kw. and the commercial and residence load increased appreciably.

At the present time a 3,000-kw. substation supplies railway, lighting and power load, energy being purchased from the Ohio Utilities Company.

G. K. Vaughters is general manager of the Chillicothe company, J. C. Martin is secretary-treasurer, and F. K. Sexauer is assistant manager.

Half-Million-Kilowatt Development Proposed on Delaware River

ANNOUNCEMENT of a proposed plan to develop about 500,000 kw. in water power on the Delaware River, at a total cost estimated at $200,000,000, has been made by Paul T. Brady of the Westinghouse Electric & Manufacturing Company. Active work will be commenced as soon as authorization is received from the Federal Water Power Commission. The plan calls for the construction of four dams, at or near Belvedere, Bushkill, Shohola and Butler's Rift, with an average head of 80 ft. The total power capacity of these four dams is estimated at about 500,000 kw. at normal high water. In addition a steam-power plant with a capacity of 100,000 kw. will be erected somewhere in New Jersey in order to supplement the hydro-electric plants during seasons of low water.

Power will be sold wholesale in large blocks in New Jersey, eastern Pennsylvania and southern New York, though it is believed at this time that New Jersey will take the major part of the total output. If present plans are carried out the steam power plant and two of the hydro plants will be in operation by Jan. 1, 1923.

Mr. Brady has applications covering all of the desirable water-power sites in the hands of the Federal Water Power Commission, where they are grouped under the title of Project No. 22. He is at present working in an individual capacity, but will turn the whole proposition over to a corporation as soon as the necessary preliminaries are settled. Associated with Mr. Brady are Duncan, Young & Company, the L. B. Stillwell Engineering Company and the engineers of the Westinghouse Electric & Manufacturing Company.

Governors Hold State Regulation of Utilities Essential

Replies Received by Former Gov. Charles H. Brough of Arkansas from Chief Executives of Thirty-four States with Some Form of Public Utility Commission Very Gratifying in View of Political Efforts to Discredit Commission Rule

IN NOT a few states the principle of state regulation of public service corporations is being questioned by politicians in an effort to make a popular appeal. In virtually every case the commission has been charged with playing into the hands of the utilities by raising rates. So far as can be learned there is no public demand for the abolition of state regulation. In some states, it is true, a governor was elected last fall on a platform one of the planks of which was abolition of state utility regulation. However, sight must not be lost of the fact that the election resulted in a party "landslide" and that local issues were largely ignored by the voters in their preoccupation with national affairs.

One of those states where public utility regulation figured was Arkansas. Gov. Charles H. Brough, who was defeated for re-election, stood out strong for state regulation, and even after the results of the November election became known he continued in his efforts to retain the Arkansas commission. As a part of his endeavors in this direction he sent a telegram late in December to the governors of all the states and received replies from thirty-four having state regulation of utilities. It is evident from these replies, which speak for themselves, that state regulation has justified itself and is too firmly rooted to be dislodged by the political assaults of misinformed demagogues. The replies which were received by Governor Brough are as follows:

PENNSYLVANIA — *William C. Sproul*, Governor.—We have in this state a public service commission which has been extremely useful. We would not think of abolishing it.

ILLINOIS—*Frank O. Lowden*, Governor.—Of course there has been criticism of our public utility commission because of the necessity of increasing rates in consequence of the war. Up to two years ago, however, the decreases in rates were much more numerous and greater than the increases. It looks now as though it would be possible in the next few years for the commission again to reduce rates and indeed protect the public better than could be done without the commission.

RHODE ISLAND—*R. Livingston Beeckman*, Governor.—We find our public utilities commission of three members a great success and can see no reason for abolishing it.

Nevada Gives Five Reasons

NEVADA — *E. D. Boyle*, Governor. — Nevada has had a railroad and public utilities commission since 1907. In 1909 its name was changed and the personnel slightly altered, but the functions remain the same. We consider it an indispensable department, first because it keeps public service corporations out of politics; second, because it properly and intelligently represents the state before the Interstate Commerce Commission on all interstate rates affecting our people; third, because it effects by informal methods satisfactory adjustments of interstate rates and service; fourth, because it shuts out improper and destructive competition, and, fifth, because it saves our industries and people hundreds of thousands of dollars annually. I may observe that there is just the same need for the state public service commission now as existed before passage of Esch-Cummings bill.

Step Backward

IDAHO—*D. W. Davis*, Governor.—This state has a public utilities commission of three members. We expect to continue this commission, as I believe it would be a sad step backward to abrogate state regulation of utilities.

WYOMING—*R. D. Carey*, Governor.—It would seem to me that for any state to do away with its public utilities commission would be a step backward. It is my intention to ask our Legislature to increase the powers of our commission, although it has accomplished much under our present law.

KANSAS—*Henry J. Allen*, Governor.—The Kansas Public Utilities Commission was established January, 1911. Over four thousand cases have been taken before this commission, with the number gradually increasing. Less than 1 per cent of the cases are appealed to the courts. Very few decisions are reversed.

VERMONT—*Percival W. Clement*, Governor.—The public service commission of three members is working out satisfactorily in this state. I am recommending increased authority and facilities to enable the commission to investigate more thoroughly affairs that come up for approval or regulation.

MISSOURI—*Frederick D. Gardner*, Governor.—We have in this state a public service commission of five members. They have been compelled, owing to the high costs of everything, to grant increased rates to public utility corporations. This has raised, of course, a clamor over the state, but thoughtful people and those who have studied the situation realize, in my judgment, that the situation would have been far worse without a public service commission. Personally I most assuredly feel that the public service commission is an important and necessary adjunct of the state government.

No Justification for Abolishment

UTAH—*Simon Bamberger*, Governor.—A public utilities commission was established in Utah four years ago on the theory of urgent need for the proper regulation of common carriers, and I cannot conceive of any justification for its abolishment. Under its direction needs and returns of carriers are investigated, and every effort is made to arrive at an adjustment that is equitable to all. Its decisions are bound to create a limited dissatisfaction temporarily, but in the end its actions almost without exception prove to have been warranted.

MISSISSIPPI—*Lee M. Russell*, Governor.—We are highly pleased with the work of our bond improvement commission. Our people are thoroughly satisfied with this commission and would not do without it.

WASHINGTON—*Louis F. Hart*, Governor.—Several years ago our Legislature created a public service commission of three members to regulate pub-

lic utilities and public service corporations. Our experience with this commission has been most satisfactory. Its work has been of incalculable benefit to the people of our state both in regulating rates and service, lowering the former and raising the standard of the latter.

NEBRASKA—*Samuel R. McKelvie*, Governor.—Our railway commission is a constitutional body. I think it has done good work.

Invaluable Arm of State Government

OKLAHOMA—*J. B A. Robertson*, Governor.—I think it very essential in these days to have a corporation commission or a similar board to regulate and control public utilities. While our commission has not given entire satisfaction, it is not the fault of the system so much as it is of recent conditions in the business world.

WEST VIRGINIA—*John J. Cornwell*, Governor.—This state has had a commission regulating all public utilities for about ten years. It is indispensable and there is no sentiment for repeal of the law.

LOUISIANA—*John M. Parker*, Governor.—Louisiana has had for a number of years a railroad commission in charge of railroad, telegraph, telephone and express utilities within the state. It has been an invaluable arm of state government, and there is no thought of dispensing with it. Louisiana has no state regulation of municipal utilities. A bill for a general utilities commission failed at the 1920 session of the Louisiana Legislature.

"Proved Its Usefulness," Says Coolidge

MASSACHUSETTS—*Henry F. Long*, secretary to Governor.—Governor Coolidge wishes me to reply to your telegram and say that the public utilities commission of Massachusetts is composed of a chairman and four associate members as a permanently established commission and has done excellent work. There is no intention in Massachusetts of doing away with this commission, which has proved its usefulness.

NORTH DAKOTA—*Lynn J. Frazier*, Governor.—A board of railroad commissioners consisting of three members regularly controls and fixes rates, charges and service of all public utilities. I believe that it is necessary to have some such board with power to make these regulations.

NEW MEXICO—*O. A. Larrazola*, Governor.—The corporation commission in New Mexico has not given all the good results it should for lack of sufficient power under the law. If it is properly empowered to act I consider such a commission not only good but almost indispensable.

MONTANA—*S. V Stewart*, Governor.—Montana's experience with a public utilities commission has been entirely satisfactory.

WISCONSIN—*E. L. Philipp*, Governor,—Wisconsin has maintained a railroad commission for fifteen years, consisting of three members, which has charge of steam railways, water power and other public utilities. The result has been generally satisfactory, and there has been no disposition on the part of the people to discontinue this organization.

KENTUCKY—*Edwin P. Morrow*, Governor.—The experience of Kentucky with a railroad commission is most satisfactory as far as its powers extend. The tendency of legislation is to increase its power and scope into a general public utility commission to include telephone, telegraph, natural gas, etc.

Source of Daily Usefulness

COLORADO—*Oliver H. Shoup*, Governor.—The Colorado Public Utilities Commission during six years has handled 380 formal and 1,100 informal cases besides many other matters not placed on the docket. Its experience because of rate advances, induced by abnormal operating costs in some instances, has been similar to that of other state commissions, but the people of Colorado on the whole have shown confidence in the commission and its work. Efficiency of state regulation is proved by the many cases of home-rule cities applying to the commission for assistance. A study of its activities would show that in regulation and supervision of public utilities and service even more than of rates the commission is a source of daily usefulness to the public. There is no question that state regulation of public utilities has proved its value here.

GEORGIA—*Hugh M. Dorsey*, Governor.—Our commission, the first ever created in the Union, functions well. We would not consider repealing the law.

NEW HAMPSHIRE—*John H. Bartlett*, Governor.—We are well satisfied with our utilities service commission and believe that our method is the best way to regulate utilities.

Here to Stay

MARYLAND—*Albert C. Ritchie*, Governor.—Maryland has had a public service commission since 1910, and state regulation is here to stay.

MAINE—*Carl E Milliken*, Governor.—We have a public utility commission in Maine. I believe in that method of regulating public utilities.

ARIZONA—*Thomas E Campbell*, Governor.—I am a subscriber to the principle of regulation of public utilities through a properly constituted board or commission, preferably the latter. Any success of such a department depends upon its personnel and the powers granted by legislation. I cannot commend the results obtained by the Arizona Corporation Commission, but I charge the weakness to its personnel rather than to failure of principle.

Justified Its Existence in California

CALIFORNIA—*William D. Stephens*, Governor.—The State Railroad Commission of California in regulating public utility rates has justified its existence in every way. California is strongly for just such a body.

INDIANA—*James P Goodrich*, Governor.—Our public utility commission has been in force in Indiana for the past ten years, and has given complete satisfaction. It is undoubtedly a great step in advance and will be retained in our state.

CONNECTICUT — *Marcus H. Holcomb*, Governor.—Our public utilities commission has rendered a valuable service in regulating trolley conditions and other public utilities. Dispensing with the commission would not be considered.

OREGON—*D H. Upjohn*, secretary to Governor.—The public service commission here has functioned successfully. Some efforts have been made to abolish it, but have proved futile so far.

Should Extend Powers

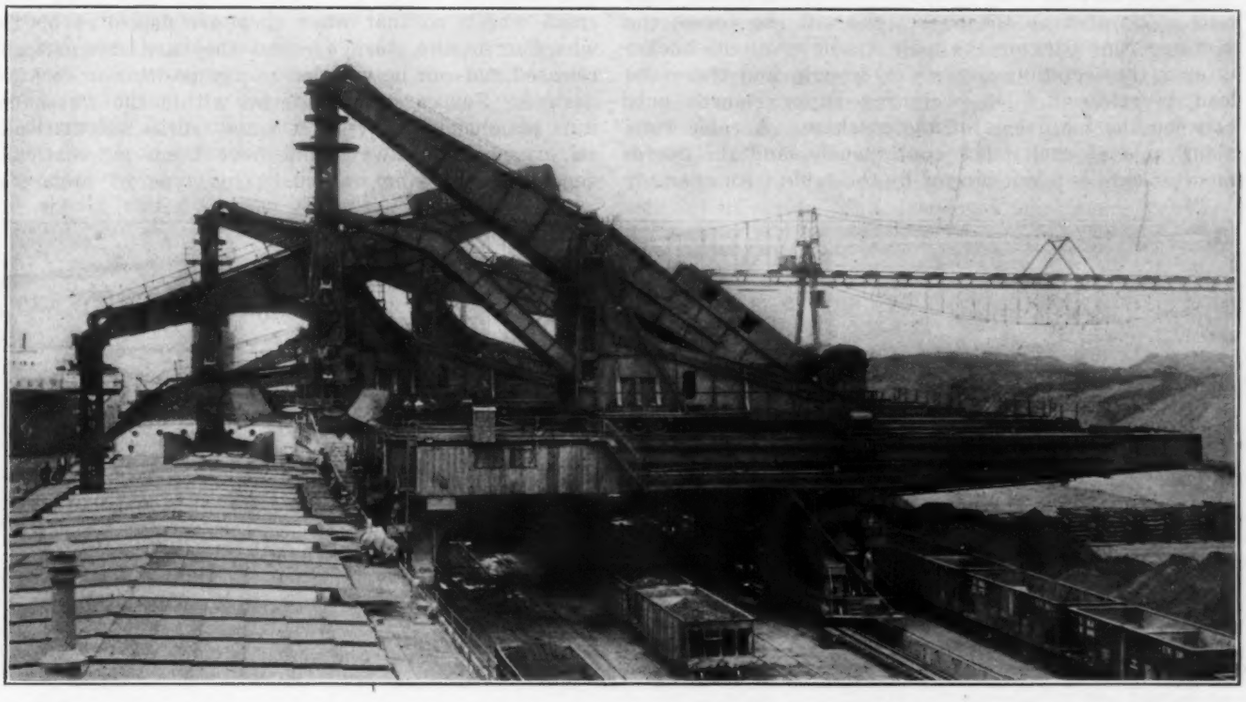
ALABAMA—*Thomas E. Kilby*, Governor. — The Alabama Legislature created a public service commission in 1915, placing upon it the duties of the old railroad commission. The commission did not give general satisfaction, and the Legislature in special session in 1920 placed additional duties upon the commission, increasing salaries and requiring commissioners to live in Montgomery. My belief is that under the present law better results will be obtained.

MICHIGAN—*Albert E Sleeper*, Governor.—Michigan created a railroad commission in 1897 and gradually extended its powers to include other utilities in 1919. A new statute changed the railroad commission to a general public utility commission with broadened powers. I believe such a commission is absolutely indispensable, but its powers should be further extended. I believe our commission, which was created in 1919, has been almost indispensable to the welfare of the state. State regulation certainly should be perpetuated.

Electrifying Facilitates Port Operation*

The Reduction of Port Delays Is Possible Through the Use of Modern Loading and Unloading Equipment — Description of Some Types of Electrical Equipment Which Have Proved to Be Suitable for Such Work

By COMMANDER C. S. McDOWELL,
United States Navy



ORE HANDLING AT GREAT LAKES TERMINALS IS A SPECIALIZED PROBLEM, BUT SHOWS WHAT MIGHT BE DONE AT OTHER PORTS

TO UTILIZE our port facilities economically it is highly important that the delays in port, waiting to unload and load cargo, should be cut down to the minimum. There is no particular purpose in providing economical propelling and auxiliary machinery on shipboard if all the saving obtained by such improvements is eaten up by unnecessary delays of this nature.

We need fewer and more highly skilled, better paid shipmen and dockmen, with the very latest, speediest machines for loading and unloading. Such facilities both ashore and on board ship, combined with the higher skill of America in operating and caring for machinery, afford our chance to offset the higher wage which is paid our seamen and put us on a competitive footing with our friends in the Atlantic or in the Pacific.

The simplest method and the one allowing the most economical handling of freight is the one where standard ships run between two definite ports, always utilize the same terminals and carry only bulk or standard package freight. Under such conditions the special problem may be solved by installation of permanent electrically operated conveyors of different types, electric cranes, mechanical unloaders, etc., and cargo may be handled in much the same manner at ocean terminals as ore is handled on the Great Lakes. The above condition also permits the installation of all the cargo-handling apparatus on shore and eliminates the present steam winch, which is notoriously inefficient, from the ship. It also, by the same elimination, puts the cargo-handling gear where it is used almost continuously and removes this gear from the ship, where it has been a large expense to install and keep in order, and has served no use except for a short time at the end of each voyage.

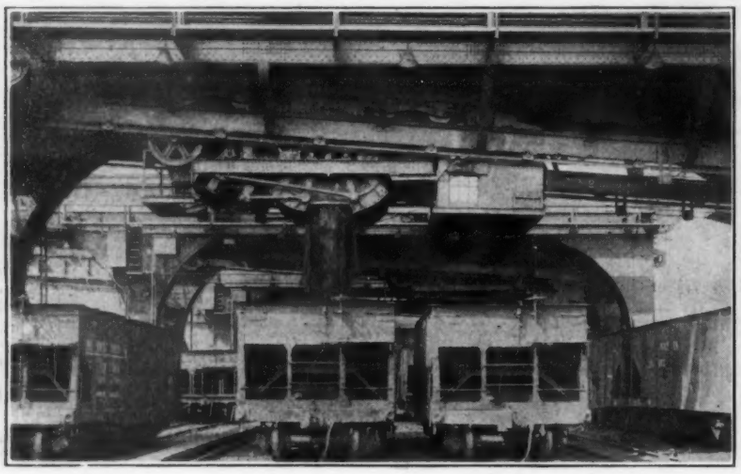
Although piers with gravity feed have been built in the past twenty years, the present trend is apparently toward the belt-conveyor system, electrically driven. Thus one of the latest coal piers built is the loading pier for the Baltimore & Ohio Railroad at Curtis Bay, Baltimore, at which the cars are dumped in the yard on shore on the tail end of the system of four parallel 60-in. (1.5-m.) belt conveyors, each of which discharges to the vessel by means of a large "tripper" consisting of a movable steel tower, which carries pulleys over which the belt turns back on itself to discharge its load.

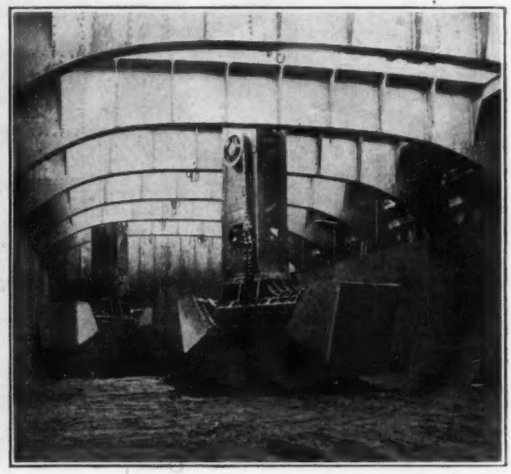
The above is given as an example of what may be done in the loading of a uniform bulk cargo, in the case of coal piers; the proposition is simply one of loading; if unloading is to be provided for, an entirely different type of equipment is required, and in such a case for bulk cargoes separate piers are usually provided.

Unloading of bulk cargoes has not been brought to

*Discussed at Jan. 28 meeting of American Institute of Electrical Engineers and American Society of Mechanical Engineers.

the same degree of efficiency, as the loading record on the lakes of two and one-half hours for unloading a 10,000-ton vessel, as compared with twenty-three minutes for loading it, will show. The Hulett "grasshopper" unloader is now in general use and consists essentially of a massive frame or walking beam, the front end resting on the face of the dock and the rear end on a slightly raised concrete wall. On this frame is a carriage moving backward and forward over the trough. The outer ends of the walking beam are legs which reach down into the hold, the whole mechanism being operated by one man. When a load of 15 to 20 tons is elevated by the bucket clear of the vessel, the carriage runs back on the main frame until the bucket is over the weighing hopper or trough, and there the load is released. The weighing hopper moves only between the main legs of the machine. A cable runs along side of each track continuously, and the movement of cars is taken care of by the cable. An operator pulls a lever on the mechanical clamp which is attached to the train and moves the train a car length for the next load.





UNLOADING TIME HAS BEEN REDUCED TO TWO AND ONE-HALF HOURS FOR A 10,000-TON ORE VESSEL BY PROPER ELECTRIC TERMINAL FACILITIES

The cheapening of the cost of unloading through the successive steps by which the process has been improved since 1880 is shown by the following figures: Cost of unloading a ton of coal with wheelbarrows, 56 cents; with Brown machine and shovelers, 28 cents; with Brown fast plants, 12 cents; with Hulett fast plants, 4 cents.

At the port of New Orleans, where bananas are unloaded in greater quantities than in any other port in this country, the handling of the unloading by mechanical devices has been developed until practically all of the bananas are now unloaded by machines. The general plan is to employ unloaders of a structural steel framework supported by railway trucks running on standard railway tracks set close to and parallel with the face of the wharf. The framework supports a double boom which can be adjusted into position over the hatchway of the ship. Over the booms constant running chains are installed which are equipped to carry several bunches of bananas in huge slings. The chain is lowered through the hatchway by means of the adjustable booms, and after being placed into position the bananas are placed in this sling and removed from the hold to be deposited on a receiving table on the wharf. Trolley conveyors are utilized for distributing the bunches of bananas to refrigerator cars on railroad sidings running perpendicular to the face of the wharf, these conveyors having branches to each siding.

Mechanical unloaders of a construction similar to that given above have been designed for handling miscellaneous cargoes and are installed or being installed at some army bases. They consist of structural framework with double boom and constant running chain carriers similar to the one mentioned above. The plan in this instance is to carry small trucks loaded with miscellaneous cargoes. These trucks are fitted with small wheels so that when they are deposited on the wharf or in the storage rooms they are automatically released and can be wheeled to any position or location desired. For carrying material within the warehouse it is planned to carry these same trucks automatically on overhead trackways and have them automatically deposited wherever wanted. This type of apparatus is reversible and can be used for both loading and unloading ships.

In the case of bags and bales not very much progress has been made in the utilization of continuous-movement apparatus, although unloaders of the conveyor or continuous-chain type have been developed and installed in some cases. The electric crane has been developed to such efficiency that it is probable that continuous-movement unloading machinery would have a hard time competing with it. Bags and crates unloaded through hatches are lifted in the rope sling by boom or crane and deposited on the wharf deck for handling. In some cases, however, conveyors have been built with a movable section, permitting them to be extended to the deck of the ship, where bags, barrels, etc., are fed to slings which lower a slingful at a time into the hold. In case of unloading the slings are used to take the freight from the hold.

Miscellaneous Cargo Difficult to Handle

For the handling of miscellaneous cargo an electric crane is most essential, and it appears preferable that the cargo be handled directly into the ship's hold with the crane without the use of the ship's booms. The number of cranes to be provided at the pier depends to a great extent upon the character of the pier itself. If room and facilities are available for feeding cargoes

to each hatch, then there should be sufficient cranes to work all hatches. It may be noted that in new basins at Hamburg the cranes are spaced every 100 ft. (30 m.). When the cargo is to be distributed in part or in whole by lighters from a pier, a desirable arrangement is to provide cranes on dolphins on the offshore side of the ship for loading and unloading to lighters at the same time the cargo is being handled on the pier. Incidentally, in connection with electric cranes, it should be noted that electric heaters are desirable for the comfort of the operator in cold weather.

On the wharf itself means are required for handling the loads for conveyors or crane hoists to and from the ship, and the old method, which is common today on many of our wharves, is the use of the hand truck. For short movements the hand truck cannot properly be dispensed with, but for most movements on the wharf the electric truck or tractor with trailer or the continuous-movement, portable piler with trailer can and should supersede the hand truck and eliminate many of the men now required to handle cargo. These trucks or tractors are usually of the storage-battery type and have demonstrated their thorough usefulness. For handling cargo on the pier an overhead trolley hoist, either of the monorail type or of the double-track type commonly used in large factories, has been developed.

For stacking freight at the terminal a tiering machine has been utilized which allows not only much more rapid tiering, with the elimination of most of the manual labor, but also tiering to much greater heights.

Stacking Machine Saves Time

In some cases two-decked piers have been built in order to save space and in order to keep incoming and outgoing freight separated without moving the ship. This form of pier usually requires a connection between the two decks and involves elevating and lowering from one deck to the other. These movements are accomplished by electric freight elevators, by continuous-movement parcel elevators, etc.

For moving freight cars at the terminal electric locomotives, of either the trolley or storage-battery type, may be provided, or electric gypsies installed. For handling ship's lines and moving ships at the pier electric winches can be used, and in addition, electric winches of the permanent or portable type can be utilized for whips, either for handling cargo on the ships or for handling on the pier itself.

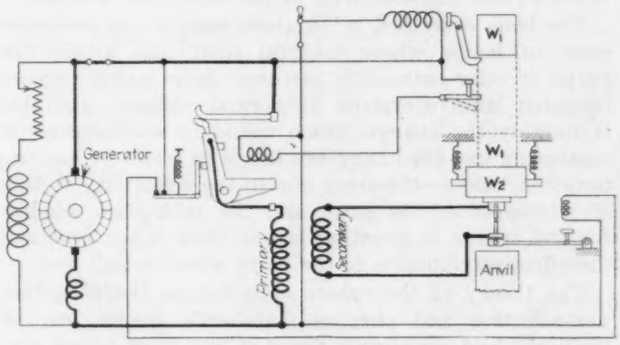
To sum up, the following are some of the electrical apparatus and devices which are available for use at terminals: Cranes, belt or chain type; conveyors, trucks, tractors with trailers, tiering machines, pilers, mechanical unloaders, permanent or portable winches, freight elevators, overhead trolley hoists and locomotives.

The electrical supply at the terminal should be of the same voltage and kind of current (direct current generally) as that in use on board ships which are to be handled. This will allow the ship to receive electrical energy from the pier for the ship's purposes, and the ship generators can be shut down while at the dock, so that all overhauling on the ship's steam and electric system can be made at the same time that freight is being discharged and received. This should materially reduce the average "turn-around" time and allow the ship's main and auxiliary machinery to have a thorough examination and overhauling while in port.

It is believed that modern port terminals offer a good electric load which central stations should endeavor to develop in order to increase the efficiency of the terminals as well as to improve the load factor of central stations.

Electro-Percussive Welding

PRODUCTION of large quantities of duplicate parts which require welding has been found to be expedited by the electro-percussive process of welding. The apparatus consists essentially of a device for producing a percussion of the parts to be welded simultaneously with a discharge of electrical energy, the energy being taken from a condenser or a magnetic field. Use is made of electrolytic condensers charged by direct current of low value, or an arrangement is used, as shown in the cut, utilizing the energy stored in a magnetic field and discharged through the parts to be welded at the moment of weld. The discharge takes place between the points to be welded with explosive violence, and at



SIMPLIFIED DIAGRAM OF WELDING

Immediately after the transformer primary circuit is broken by the falling of weight, W_1, the parts to be welded, which are connected to the secondary circuit, are slightly separated and an arc is produced between them. Completion of the fall of the weight forces the parts together, making the weld.

that instant the hammer forges the parts together into a perfect union. The time of fusion and union of the parts is only approximately .0095 second. The time sequence of events shown in an oscillogram taken during a weld between ⅜-in. (9.5-mm.) copper and steel rods indicated a peak current of 2,600 amp., an arc voltage of 30, a maximum power of 60 kw. and an energy consumption of 0.00077 kw.-hr. The time of the complete operation was 0.094 second.

The advantages of this process are as follows: At least three-fourths of the power consumption is saved as compared with butt welding; the speed of the process is very great and thus production depends almost entirely on the time required to handle the pieces; unusual welds may be accomplished, such as welding of small rods to heavy plates or blocks, without previous treatment or preparation of the surface; the energy is consumed in a very small amount of material and does not heat up the rest of the stock, and it may therefore be used where excessive temperatures of the whole stock would cause a loss of temper; unlike metals may be welded as readily as metals of like kind; the character of the welds realized after a proper adjustment of the apparatus is made is independent of the skill of the operator, thereby reducing labor cost, and the percussive process produces a much smaller fin or flash than butt-welding. The reduced fin results in a decreased cost for finishing the parts.

Errors from Paint and Window in Photometric Sphere

Selectivity of Window and Paint May Cause 5 per Cent Error When Measuring Gas-Filled Lamp with Vacuum Comparison Lamp

BY F. E. CADY
Nela Research Laboratory, National Lamp Works, Cleveland, Ohio

THE advent of the gas-filled tungsten lamp and the introduction of the lumen rating have resulted in the largely increased use of the integrating photometer. Of the many types the Ulbricht sphere has come to be recognized as the most convenient and satisfactory, and it has been in commercial use for a number of years. The use of vacuum lamps, however, for the measurement of spherical candlepower of gas-filled lamps has introduced the question of possible errors resulting from the lack of whiteness in the paint with which the sphere is coated and the selectivity of the milk-glass window.

The tests described below show that in the measurement of lamps whose integral color lies within the range of color between a kerosene flame and a vacuum tungsten lamp operating at normal voltage—and this is roughly the change which would be encountered in measuring gas-filled tungsten lamps in terms of vacuum tungsten lamps—the error due to the selectivity or lack of whiteness of the paint and the milk-glass window for the sphere in question is less than 5 per cent and the effect attributable to the paint alone is still less.

The theory of the sphere calls for an inner surface non-selective and obeying Lambert's cosine law of incidence and emission. Since it has been found possible only to approximate such a surface, and since other sources of error are present, the substitution method of photometry must be used, and by this means and the use of a sphere of adequate size most of the errors are reduced to a second-order magnitude and can generally be neglected.

If it were always possible and convenient to have standard lamps of the same type of light distribution and giving light of the same color as that of the lamps to be tested, then the character of the paint or other material used to line the interior of the sphere and form the diffusing surface would be unimportant as long as it was moderately white and not subject to sudden changes in color or diffusing properties. But in practice it has been found desirable to make a surface as nearly white and as nearly matte as possible, and a very considerable amount of experimental work has been done on paints and substances of the type of magnesium carbonate in order to find one which would be both white and matte and remain so for a reasonable period of time. The milk-glass diffusing plate, also, used as the window and the object of photometric measurement is likely to be selective in its transmission. The effect of this will be the same as that produced in ordinary photometry if an absorption screen which has different transmission factors for light of different wave lengths is used in the measurement of sources of different integral color.

Aside from the experiments of Dyhr,* little if any work seems to have been done on the magnitude of this particular error. The question is of especial importance in connection with the measurement of gas-filled tungsten lamps in terms of vacuum lamps. The latter can be readily standardized by the point-by-point method, but they differ considerably in color value from the higher-temperature gas-filled lamps. Another reason for determining the magnitude of the selectivity error lies in the advantage of knowing how much discoloration is permissible before the paint must be renewed.

Some data on this question were obtained in connection with a test, using an 80-in. (200-cm.) Ulbricht sphere, to determine the total light absorption in some vacuum lamps tinted to a color such that the resultant light matched that of a kerosene flame.

TWO TEST METHODS CHECK CONCLUSIONS

Two methods were employed. In the first method a set of ten frosted lamps of the ordinary 40-watt type were measured for mean horizontal candlepower. Using a universal rotator, the reduction factors of three of the lamps were measured and the average value was applied to the mean horizontal candlepower values of the rest of the lamps to give the mean spherical candlepowers. The latter were then obtained directly in the sphere. Then the ten lamps were tinted, and a similar set of measurements was carried through both on the regular photometer and in the sphere.

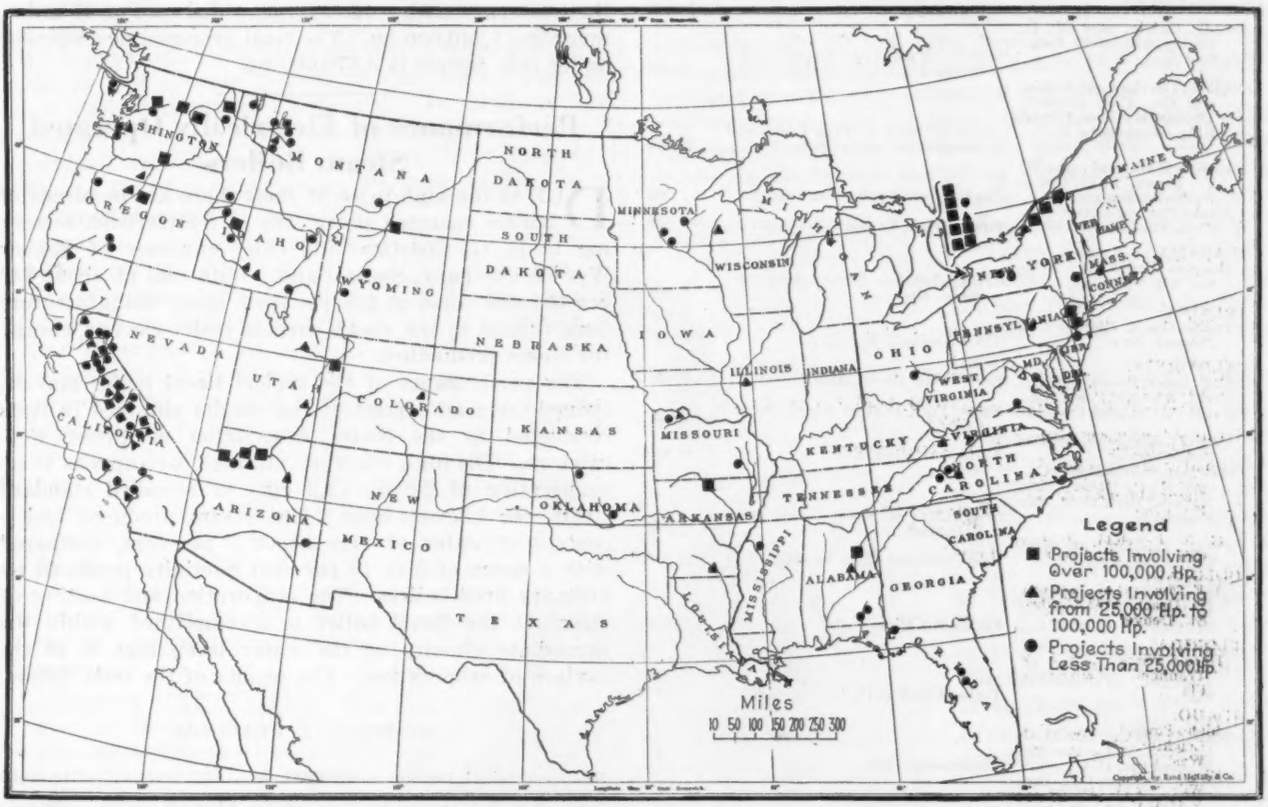
To eliminate as far as possible the complications due to heterochromatic photometry another method was used as a check. Calling a lamp which matched in color the kerosene flame the red lamp and an ordinary clear bulb lamp the clear lamp, measurements were made on the ordinary photometer of the mean horizontal candlepower of the red lamp against the stationary candlepower of another red lamp used as a comparison lamp. In exactly the same manner the clear lamp was compared against a clear lamp. From these data and the known reduction factors of the red and clear lamps the ratio of the mean spherical candlepowers was computed in terms of the ratio of the stationary candlepowers of the comparison lamps. The ratio of the mean spherical candlepowers was then obtained in the sphere, taking care so to orient the red and clear comparison lamps that their stationary candlepowers in the direction of the photometer head were the same as when they were used on the regular photometer bench. Owing to the selectivity of the paint and window of the sphere, there was a color difference evident in the photometer during these measurements on the sphere, but the effect was present in the same direction and so nearly to the same extent with both types of lamps that the heterochromatic error would be negligible.

The results by the first method showed a difference in the average of the mean spherical candlepowers of the ten tinted lamps obtained in the sphere and directly by the point-by-point method of 4.5 per cent. The second method gave a difference in the same direction in the ratio of tinted to clear lamps of 5.1 per cent. The latter test was made about a month and a half after the first test, and in the meantime the paint may easily have discolored sufficiently to account for part of the slight discrepancy in the results by the two methods. By altering the voltage of the comparison lamp as used with the sphere, the departure from whiteness of the light transmitted through the milk-glass window, due to the combined effect of the selectivity of the paint and the glass, was found to be roughly the same as the difference in integral color of a vacuum tungsten lamp when operated at normal temperature and at a temperature 400 deg. C. lower.

*_Elektrotechnische Zeitschrift_, Vol. 31, page 1295 (1910).

Water-Power Applications, 13,469,181 Hp.

Federal Power Commission Reports 168 Applications for Preliminary Permits on Jan. 29—Twenty-five Applications Filed During Month of January—Arizona Leads All States in Total Horsepower Involved



LOCATION AND SIZE OF HYDRO-ELECTRIC PROJECTS ON FILE WITH FEDERAL POWER COMMISSION JAN. 29, 1921

WATER-POWER applications on file with the Federal Power Commission on Jan. 29 numbered 168, totaling 15,924,831 hp., of which 2,455,650 hp. was in conflict, giving a net total of 13,469,181 hp. In January twenty-five applications, involving 851,100 hp., were placed on file. It appears that applications involving the larger feasible power projects of the country were filed prior to 1921. The filings for January averaged only 34,000 hp., whereas the average of all applications filed to Jan. 29 was 94,800 hp. The average of the applications filed during 1920 was 106,500 hp. During January only two new projects totaled or exceeded 100,000 hp., and one of these was in conflict with a previous filing. The horsepower involved in all applications is about 27 per cent of the estimated maximum potential water powers of the country and 57 per cent of the estimated minimum potential water powers. The location and size of the various projects on file with the Federal Power Commission on Jan. 29 are indicated on the map.

Table I gives the distribution of the contemplated power developments among the various states. The high figures shown for Arizona are confined in large part to contemplated projects in the Grand Canyon of the Colorado River, and the greater portion of the projects in New York State are at Niagara Falls and on the St. Lawrence River. The projects in California are well scattered, and practically every important watershed in that state is involved in one or more applications. More than one-half of the states of the Union are represented, the waters of only twenty-three states not being involved.

TABLE I—DISTRIBUTION OF CONTEMPLATED POWER DEVELOPMENT AMONG THE VARIOUS STATES

Alabama	155,000	New Jersey	432,300
Alaska	134,350	New York	2,883,750
Arizona	4,159,200	North Carolina	3,400
Arkansas	125,000	Oklahoma	4,500
California	2,509,903	Oregon	539,250
Colorado	50,700	Ohio	150
Florida	9,000	Pennsylvania	20,000
Idaho	277,740	Utah	205,000
Illinois	40,000	Virginia	148,000
Massachusetts	20,000	Washington	1,115,000
Minnesota	17,000	Wisconsin	75,000
Mississippi	1,500	Wyoming	5,010
Missouri	32,000		
Montana	506,428	Total	13,469,181

In Table II is given a list of the applications filed with the commission from Dec. 30, 1920, through Jan. 29, 1921. Lists of applications filed prior to Dec. 30 appear in the ELECTRICAL WORLD of Jan. 1 and Jan. 15.

By far the largest single development yet proposed under the new water-power legislation is that by the Southern California Edison Company in the Grand Can-

TABLE II—LOCATION AND SIZE OF WATER POWER PROJECTS FOR WHICH APPLICATIONS FOR PRELIMINARY PERMITS WERE FILED WITH THE FEDERAL POWER COMMISSION FROM DEC. 30, 1920, TO JAN. 29, 1921, INCLUSIVE

Name of Company	Location of Project	Capacity Hp.
ALASKA:		
Geo. C. Hazelet, Cordova, Alaska	Outlet of Silver Lake	12,000
Paul Butler, 233 W. Monroe St., Chicago	Outlet Swan Lake, Mirror Lake and Big Lake	29,000
J. G. Galvin, care M. D. Leehey, 620 Alaska Bldg., Seattle	Mill Creek and Lake Virginia near Wrangell	10,000
Alaska Development & Mineral Co., Care Burdett, Thompson & Low, 4 Ouray Bldg., Washington D. C.	Lake at head of Tyee Creek and reservoir on Annan Creek	14,000
Lincoln Waln et al., care W. T. Young, P. O. Box 6, Nashville, Tenn	Power Creek, 4 miles from Cordova.	300
Alaska Public Utilities, Cordova, Alaska	Power Creek, 4 miles from Cordova.	300
ALABAMA:		
Houston Power Co., Newton, Ala	Choctawhatchee River at Hollis Bridge site	2,000
ARIZONA:		
Pacific Gas & Electric Co., Phoenix, Ariz	Transmission line	.....
CALIFORNIA:		
C. E. Loose, Provo, Utah	East Walker River, Mono County	8,000
Great Western Power Co., 233 Port St., San Francisco	North Fork Feather River, Butte County	5,200
City of Los Angeles, Dept. of Public Service	South Fork Kern River	43,450
Southern Sierras Power Co., care H. L. Huber, First National Bank Bldg., San Francisco	Headwaters of Snow Creek near Beaumont	12,000
C. E. Fairchild, 10 West Citrus Ave., Redlands	Bear Creek and Santa Ana River	12,750
COLORADO:		
J. F. Meyer et al., care of E. E. Drach, 1133 Clarkson St., Denver	Frying Pan River	50,000
FLORIDA:		
Harold Winter, care W. W. Trammell, Tallahassee, Fla	Turkey Creek at Turkey Creek Hill.	400
IDAHO:		
Idaho Power Co., care M. O. Leighton, McLachlen Bld., Washington, D. C	Transmission line	.....
Elmore Copper Co., care Wilkerson, Cassells, Putter & Gilbert, The Rookery, Chicago	South Fork Boise River	3,000
City of Boise	North and South Forks of Payette River	12,000
NEW YORK:		
New York & Ontario Power Co., care G. E. Van Kennen, Ogdensburg	South Channel of St. Lawrence River at Waddington	25,000
New York & Ontario Power Co., care of Spratt & Van Kennen, Ogdensburg	St. Lawrence River from Murphy to Lotus Island	250,000
Lockport Paper Co., care Clinton & Clinton, Buffalo	State Barge Canal at Lockport	500
OHIO:		
McConnelsville-Malta Electric Co., McConnelsville.	U. S. dam No. 7 on Muskingum Riv.	150
OREGON:		
H. S. McGowan, McGowan.	Metolius Power Site on Deschutes River	84,000
H. S. McGowan, McGowan.	Reclamation Power Site on Deschutes River	47,000
S. A. Mushen et al., Lakeview	Deep and Camas Creeks	1,000
C. S. Benefiel, Paisley	Small stream	50
UTAH:		
Utah Light & Power Co., care M. O. Leighton, McLachlen Bldg., Washington, D. C	Green River above Green River	80,000
Utah Power & Light Co., care M. O. Leighton, McLachlen Bldg., Washington, D. C	Green River above Bridgeport	100,000
WASHINGTON:		
C. I. Kephart, 1415 Rhode Island Ave., N. W., Washington, D. C	Kalama and Lewis Rivers	19,000
C. I. Kephart, 1415 Rhode Island Ave., N. W., Washington, D. C	Spirit Lake and Toutle River.	25,000
WYOMING:		
Wyoming Paper Co., Shoshoni	Stream not named	5,000

yon of the Colorado River. This project contemplates a high dam and large reservoir near Lees Ferry, Colorado River, in Coconino County, Ariz. Three power developments are proposed—from the dam to point near mouth of Little Colorado River, involving 1,240,000 hp. and known as the Marble Canyon unit; the Bright Angel unit from the mouth of the Little Colorado River to Kanab Creek, a distance of 85 miles, involving 1,090,000 hp., and the Diamond Creek unit from Kanab Creek to the western boundry of Arizona, a distance of 45 miles, involving 1,240,000 hp. The total proposed development under this permit is 3,570,000 hp.

Performance of Electrically Operated Steam Boilers

DUE to the high price of fuels there are hundreds of boilers operated electrically in Switzerland, according to E. G. Constam-Gull, chief engineer of Escher Wyss & Company, Switzerland. With coal at about $49 per ton and wood at $28 per cord, many manufacturers have turned to the cheap surplus hydro-electric energy for steam production.

The performance of the typical Revel boiler may be judged from an extract of the results obtained in tests conducted by the Swiss Association of Boiler Proprietors. The high efficiency attained corresponds to an evaporation of 2.9 lb. (1.3 kg.) of so-called standard steam per kilowatt-hour. The steam produced had a content of water of only about 3 per cent, compared with a steam of 5 to 10 per cent humidity produced by ordinary fired boilers. The evaporation and heating of steam in the Revel boiler is accomplished within the immediate vicinity of the water level, that is at the surface of evaporation. The results of the tests follow:

ELECTRICAL READINGS	
Mean electrical tension (rectified)	219 volts
Ammeter readings	384 amp.
Mean electrical energy readings of the kilowatt meter (rectified)	367 kw.
Mean electrical energy per hour	146.7 kw.-hr.
Coefficient of correction of the kw. meter	0.96
EVAPORATION	
Mean gage pressure in the boiler	94.5 lb. per sq. in.
Mean temperature of feed water	50 deg. F.
Mean temperature of the waste water before check valve	57.2 deg. F.
Initial heat per pound of steam	1,176 B.t.u.
Total evaporation (gross)	1,015 lb.
Steam produced per kw.-hr. (gross)	2.77 lb.
Water of 50 deg. F. inlet temperature converted into steam at 212 deg. F. (normal steam)	2.83 lb. per kw.-hr.
Quantity of water contained in the steam	29.8 lb.
Percentage of water contained in the steam	2.9
Total quantity of feed water fed into the boiler	1,700 lb.
Since 685 lb. of waste water flowed out through the check valve, this was raised from the initial temperature of 50 deg. F. to 57.2 deg. F.	
Hence heat utilized from steam production	= 1,015 × 1,176 = 1,193,000 B.t.u.
Necessary heat for raising the temperature of the waste water	= 685 × 7.2 = 4,930 B.t.u.
Total electrically generated effective heat	= 1,197,930 B.t.u.
Efficiency of evaporation	95.3 per cent
Converted for the heating of the water	= 0.4 per cent
Total efficiency	95.9 per cent
Losses	4.3 per cent

As will be seen from the foregoing table, 1 kw.-hr. converted 2.83 lb. (1.28 kg.) of water from 50 deg. F. into steam at 212 deg. F. (normal steam) and therefore the efficiency of evaporation was 95.7 per cent. The electrical energy was used at the rate of only 146.7 kw. although the boiler had been designed for a capacity of 200 kw. This information concerning the use of electrical energy for steam raising was compiled by E. G. Constam-Gull in an article for Aug. 12, 1920, in the *Canadian Engineer*.

Edison at Thirty Years

Already Famous in 1876, with Two Hundred Patents to His Credit—Forty-two-Year-Old Sketch of His Early Achievements

YESTERDAY was the seventy-fourth birthday of Thomas Alva Edison, of whom every one will say:

What story is this of the year of his birth?
Let him live to a hundred. We want him on earth.

Mr. Edison refuses to grow old, and it is hard to realize that he was already famous in that far-off year that saw the Philadelphia Centennial. In 1878 or 1879, when he was a year or two past thirty, the accompanying portrait and biographical sketch of him appeared in Volume III of the "American Portrait Gallery," a collection of steel engravings now long out of print, published in New York by J. C. Buttre. The engraving bears the signature of A. H. Ritchie, N. A. The letterpress that accompanied the 240 portraits was, according to the title page, furnished by Lilian C. Buttre, who in this instance doubtless drew upon contemporary press notices of her subject. This forty-two-year-old sketch of Edison has a historical interest of its own. Some of its statements may be apocryphal, but we reprint it exactly as it appeared:

EDISON FORTY-TWO YEARS AGO

"Among the many ingenious men brought to public knowledge by electric art, no one has excited more genuine interest than Thomas Alva Edison of Menlo Park, N. J. He was born at Milan, Ohio, Feb. 11, 1847, of parents whose ancestors came from Holland. Going to the public schools until the age of fourteen, he then began to sell newspapers upon the trains of the Grand Trunk Railway, and first used the telegraph to bulletin at the various stations ahead the features of the morning news, which in those war days were likely to be startling enough. An operator taught him how to telegraph; then, to perfect his knowledge, he and a companion erected a short line between their houses at their own expense, which was small, since young Edison made everything himself, instruments and all. Battery material was dear, and to save cost he betook himself to experiment. He had seen sparks emitted from a cat's back; he inserted a tom-cat in the circuit, using the fore and hind feet as electrodes. The connections, after some resistance, having been duly made, he tried to start an induced current by rubbing the cat's back. But it would not work the line and was abandoned. The experiment illustrated the humor of the man. Then young Edison got some type and a press, set it up in the baggage car, and printed the *Grand Trunk Herald* every day on the express train. When this came to an end, he started a chemical laboratory and experimented until he set the car afire, when he and his laboratory were ignominiously bundled out. After that he was employed as a railway telegraph operator, and then went to Cincinnati in the employment of the Western Union Telegraph Company. It was here that his penchant for experimenting began to be so strongly manifested. The results were that he patented the duplex machine, by which two dispatches could be transmitted on the same wire at the same time. In 1872 the quadruplex system of telegraphy was got into shape by him, by which four messages can be sent simultaneously on one wire, two one way and two the other, and which is in daily use now. This was quickly followed by other very important inventions. The 'Electro-Motograph,' the 'Edison Universal Printer,' the 'Electric Pen,' the 'Domestic Telegraph Call,' the 'Chemical Automatic Recording Telegraph,' are only a few of the subjects to which he has applied his thoughts.

"Three very important inventions of his are the 'Carbon Telephone,' the 'Phonograph' and the 'Electric Light.'

"These with other patents now bring him in a large revenue, and the Western Union Telegraph Company pays him a good yearly bonus for the simple refusal of the first right to buy any and all of his discoveries which relate to telegraphy. Some idea of Mr. Edison's prolific brain may be gathered from the number of his patents. Of these there have been issued to him since 1870 over two hundred.

"He has now one of the amplest laboratories and the finest array of assisting machinery to be found in connection with scientific inquiry. 'His laboratory is a wonderful place. Downstairs are his office and unpacking room, where are hosts of books and steam engines and machinery, where the best workmen turn for him the delicate parts of iron and brass which are to be put together in his cunning constructions. Upstairs is the workroom. Plenty of windows give light and air and a pleasant view. Gearing from the engine can be attached anywhere needed. Telegraph wires run to New York and Washington, and a circuit of 3,000 miles can be secured, if necessary, to ascertain whether some designed improvement which works well enough in the laboratory will cope with conditions of long out-door lines. Everywhere are the implements and evidences of his craft, batteries, insulated wires, gas jets innumerable, the gas being made on the premises; telegraph machines, telescopes, microscopes, spectroscopes, and the tables are crowded with parts of new models and fragments of old machines.'

"Mr. Edison's tall form is somewhat bent with much stooping over his work, and his brown hair is streaked with gray. He wears no beard or mustache, and in rest

would hardly be called a handsome man; but when he speaks the face instantly speaks too, and the keen blue eyes, far apart, light up with quick and happy intelligence. Careless in matters of personal appearance, deaf enough to give him an abstracted look, fond of fun, quick and facile at caricature, abstemious and simple in his habits, happy only in his laboratory and his home near by, reckless of money when applied to his scientific needs, regarding time as the one precious thing, he is a man of such strong characteristics as make an indelible impress upon the world wherever he goes."

Readers' Views and Comments

Waters of National Parks Can Be Used Without Injury to Their Scenery

To the Editor of the ELECTRICAL WORLD:

SIR: After reading and passing on to the directors of this association the editorial in your Dec. 18 issue "The Beauty of Use" I am instructed to write and commend you for it. The people who live here in the shadow of the greatest of our national parks are very decidedly for the perpetuation and development of all national parks, but we know that the valuable water having its source in these reservations can and should be utilized, particularly since this can be done without the slightest injury to the national playgrounds.

JEROME G. LOCKE,
Secretary Yellowstone Irrigation Association.
Livingston, Mont.

Basis for Standardizing Electrical Apparatus

To the Editor of the ELECTRICAL WORLD:

SIR: It is generally agreed that the most applicable relation between consecutive sizes and ratings of electrical equipment is a geometric ratio; that is, a constant-percentage increase. The writer desires to point out his belief that this ratio should be an integral root of the number ten, so that some rating several sizes larger than the base rating will be exactly ten times larger.

The Arabic or "decimal" notation (with the number ten as the key) is the basis of all modern mathematics, higher and common; of the decimal logarithms of the American money system and of the metric system. Every non-decimal system of measurement used by engineers is commonly corrupted so as to be more readily significant by the adoption of a well-known unit of the system as a standard, even if a disproportionately large or small number has to be used to indicate the quantity. For instance: City surveyors express measurements of length in feet and hundredths of feet, even if miles, rods, yards and inches, or a combination of these, would give smaller figures. The tool and machinery trades use the inch and the decimal parts of it. In all the industries of design and construction where the metric system is not yet in use there is a tendency to use but one unit and to express quantity by the decimal system of numbers. Accordingly, it is desirable to have decimally recurrent ratings in electrical equipment such as: 1, 1.6, 2.5, 4.0, 6.3, 10, 16, 25, 40, 63, 100, 160, 250, etc. If the ratio between adjacent sizes is also to be constant it must be an integral root of ten.

A study of the roots of ten shows that the fifth and tenth roots ought to cover a wide range of equipment. They also have the additional merit of psychological appeal, because many terms of the series are approximately equal to whole numbers. The fractions ½ and ¼ do not appear, but fractions, simple or complex, are almost obsolete in ratings, being replaced by decimal expressions, so that recurrent ratings may be symmetrical, as 1.5, 15, 150, 1,500, etc. The alternate terms of the tenth root constitute the fifth root, so that where the fifth root is found to give gaps too large it is easy to interpolate new sizes without destroying the standards already established. The fifth roots, approximately to two significant figures, give the following series: 1.0, 1.6, 2.5, 4.0, 6.3, 10.0. The tenth root series is: 1.0, 1.3, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.3, 7.9, 10.0.

The standardization of motor sizes is intimately related to the standardization of wire sizes, which was completed a long time ago. The even sizes of the B. & S. wire gage are the only ones used commercially in distribution, and the resistance or voltage-drop ratio between these is 1.59. That is, the ratio between maximum motor loads on wire lines, long enough to be determined by permissible voltage drop, and two gages apart, is almost exactly equal to the fifth root of ten, 1.5849, suggested as a ratio between adjacent motor ratings. The ratio between the underwriters' current ratings for sizes three gage numbers apart is almost exactly 1.59.

It seems that 1.58 is not too large a ratio between ratings of electrical motors, where in extreme cases the normal voltage may be 5 per cent different from the rating, where the voltage may vary 10 per cent from normal, where there is usually 10 per cent to 30 per cent inaccuracy in the estimate of the average and maximum load, where the load may vary 10 per cent with the weather (in the case of belted plain-bearing shaft drives without an idler), and where improvements in manufacturing practice may increase the load 25 per cent. There are very few installations where the maximum future load of a motor may be calculated closely. In the metal-working industries there are none. The load on a motor driving a drill press, rated by a maximum-sized hole, may be changed 40 per cent tomorrow by the development of a better grade of high-speed steel for drills or by the use of a harder alloy steel to be drilled. The duty of a crane motor may be increased greatly when a dynamic braking controller replaces an obsolete mechanical lowering brake. It would seem that a motor raising a bascule (or jackknife) bridge would always have a constant load, but high winds and the influence of temperature, age and lubrication on the bearings prevent reasonable accuracy, and it is customary to specify motors with a normal torque twice the estimated load.

Accordingly, with so much uncertainty as to present and future loadings, with an increase in the cost of production as well as of maintenance for closely spaced ratings, and with a common factor of safety among engineers of from 4 to 10, it seems reasonable to use a ratio between sizes of 1.58. Using this ratio, the following ratings are suggested: 1, 1.6, 2.5, 4.0, 6.3, 10, 16, 25, 40, 63, 100, 160, 250, 400, 630, 1,000, 1,600, etc.

E. E. GEORGE.

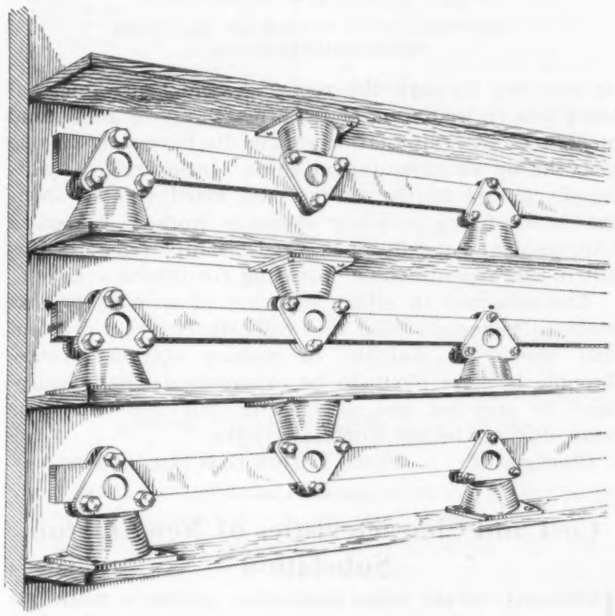
Highland Park, Ill.

Station and Operating Practice

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Bus Supports Must Be Well Designed to Withstand Short Circuits

BECAUSE very heavy stresses are put on busbar supports when overloads of the nature of short circuits occur, the supports must be carefully designed and so placed that damage will be least if the bus collapses. A good arrangement in which the supports are in compression is shown in the drawing. To give an idea of the forces that are acting, it may be pointed out that in a 30,000-kva. normally rated 2,200-volt, three-phase, 60-cycle generating station having 10 per cent generator reactance the busbar supports, 4 ft. apart, would be subjected to a stress equal to 2,560 lb. under short-circuit conditions. The magnitude of the mechanical stresses between buses was determined by the following formula which gives the pounds stress per foot length of bus under short-circuit conditions: $F = (K \times I^2) \div (10^7 \times A)$.



SCHEME FOR RUGGEDLY SUPPORTING BUSES

In this formula F = the force in pounds per foot length of bus; K is a constant which varies slightly for different arrangement of buses, but is usually 10; I is short-circuit current, and A is the distance in inches between buses. The symmetrical short-circuit current resulting from a three-bus short circuit is as follows:

$$\frac{\text{Kva (three phase)} \times 1{,}000 \times 100}{\sqrt{3} \times \text{voltage} \times \text{per cent reactance}}$$

This formula is sufficiently accurate for most practical purposes in calculating the forces on buses with the supports arranged in the usual method suitable for a switchboard. The variation in the constant 10 for different arrangements is not very great. As a figure easy to remember this formula gives a stress of 10 lb. per foot when the buses are 10 in. apart and the short-circuit current is 10,000 amp.

This information was given by G. P. Wilson of the Westinghouse Electric & Manufacturing Company, in a paper presented before the Chicago Section of the Association of Iron and Steel Electrical Engineers.

Chicago, Ill. FIELD EDITOR ELECTRICAL WORLD.

Determining Salt Concentration at Which Boilers Start Priming

REALIZING that it was essential to minimize boiler priming, which had caused damage to the turbine blading and step bearings, a test was made by the Southern California Edison Company to determine the concentration of salt at which priming began. To carry out this test sea water was pumped into a boiler and was mixed with the concentrated fresh water already in it. The quantity of sea water added was determined by titration after each addition of salt water. It developed that priming began at about 300 grains of salt per gallon (5 grams per liter) and a working concentration of 200 grains of salt per gallon (3.4 grams per liter) was adopted. This limiting salt concentration probably varies in different localities according to the proportions of other substances in the feed water. The analysis of feed waters at Long Beach and Redondo is given in Table I.

A way was thus found to determine with a fair degree of accuracy how nearly unstable the boiler water surface was. A routine was followed of sampling the water from each boiler daily, and the salt content was thus determined. From this the boiler-room foreman was instructed as to how much and often to blow down each individual boiler. Later it was found unnecessary to test boilers every day, provided that the concentration of salt in the condensate was known. With conditions at the steam plants very constant, and knowing the amount of condensate per hour, its salt content as determined by test and the number of boilers being fed, it

TABLE I—ANALYSIS OF FEED WATERS—GRAINS PER GALLON

	Long Beach, Raw	Redondo, Raw	Treated
Iron, aluminum and silicon oxide	1.44	0.96	0.55
Calcium carbonate	4.44	8.42	5.83
Magnesium carbonate	2.53	4.00	2.63
Calcium sulphate	None	None	None
Magnesium sulphate	0.83	None	None
Calcium chloride	None	None	None
Magnesium chloride	None	None	None
Sodium and potassium carbonates	5.20	1.11	4.46
Sodium sulphate	1.20	3.58	3.05
Sodium chloride	3.96	6.94	6.64
Volatile and organic matter	4.56	2.57	2.10
Total incrustants	8.41	13.38	9.01
Non-incrustants	15.75	14.20	16.25

was easy to calculate the necessary extent of blow-down to remove as much salt as entered with the condensate, maintaining a constant boiler concentration. Table II gives these data for the 850-hp. boilers:

TABLE II—BLOW-DOWN REQUIRED WITH VARIOUS AMOUNTS OF SALT IN CONDENSATE *

Grains of Salt per Gal. in Condensate	Blow-Down One Gage, 360 Gal., Every
2	8 hours
4	4 hours
6	2½ hours
8	2 hours
10	1½ hours

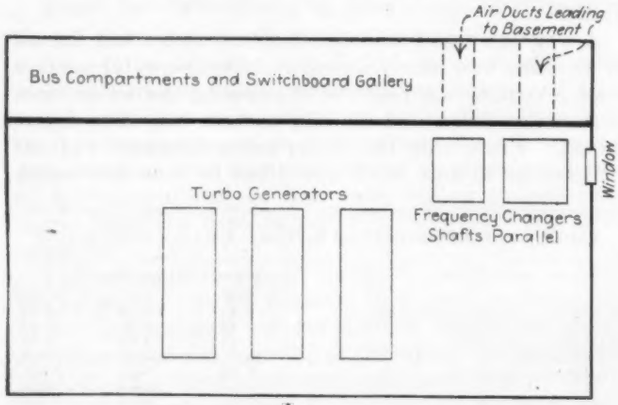
*With normal evaporation of 35,000 lb. per hour and make-up water containing 6 grains salt per gallon, this schedule will maintain a concentration of 200 grains of salt per gallon in the boiler.

It does not follow that because a 200-grain concentration was found preferable to one of 300 grains a still further reduction would be still more desirable. The most economical boiler operation will result when there is the least amount of blow-down consistent with the absence of concentration troubles.

Southern California Edison Co. R. J. C. WOOD,
Los Angeles, Cal. Electrical Engineer.

Ventilating Rotating Electric Equipment a Design Problem

AN ADEQUATE supply of air to uninclosed rotating electrical equipment in order that the ventilating provisions in the machine design may be effective is an important item in plant and substation layout. This is not always assured even though ample air inlets to the room are provided. Drawing A indicates a layout of two frequency changers in a room with three turbo-generators from which a large quantity of air was constantly discharged into the room. Despite wall openings in the wall near the frequency changers there was a constant recirculation of hot air through the machines, resulting in serious heating troubles. Recirculation was detected by throwing bits of light material

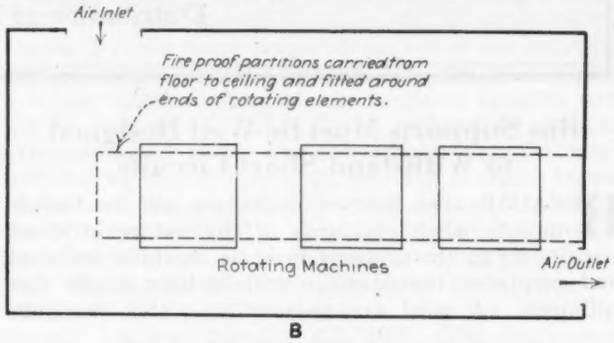


A

FREQUENCY CHANGERS (TO RIGHT) WERE OVERHEATED BY RECIRCULATING AIR

into the air currents discharged from the machines and finding them drawn back again after a few moments to the air intakes on the rotating elements. The cause was a dead pocket in the corner of the room in which the machines were installed. The only remedy available was to force air from the basement up around the machines in such a way as to break up the recirculating currents. The basement was under the machine floor and had ducts leading outside the building. Accordingly fans were placed to force air into the basement and up through floor openings to the machines. Some modification in the machine air vanes also was required.

Another type of problem is shown in drawing B. By means of fans air is brought into the room at one side and carried diagonally across, passing the machines


Air Inlet
Fire proof partitions carried from floor to ceiling and fitted around ends of rotating elements.
Rotating Machines
Air Outlet

B

PARTITIONS BUILT TO PREVENT MACHINES BECOMING OVERHEATED

on the way through the room. The difficulty encountered was recirculation of the air not only by individual machines but recirculation of air discharged from one machine by an adjoining machine. Inclosures, as indicated, carried to the ceiling and fitted tightly about the ends of the rotating elements worked a marked improvement not only in lowered machine temperatures but in more comfortable operating conditions.

The solutions in either case are of a more or less makeshift character, but they call attention to a problem that should be watched in making station layouts. Trouble is more likely to be experienced where equipment is crowded and also where full-load conditions occur during the hot summer months.

Chicago, Ill. FIELD EDITOR ELECTRICAL WORLD.

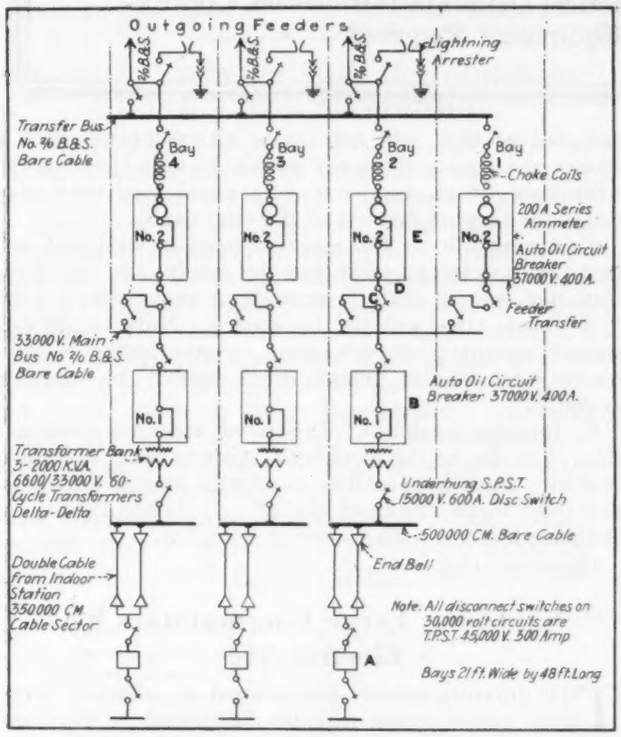
Cost and Characteristics of New Dayton Substation

INSTEAD of the usual double-bus system a main bus and a transfer bus have been installed in the first half of what will be a 36,000-kva., 6,800/33,000-volt substation of the outdoor type for delivering energy to the 33,000-volt transmission system of the Dayton (Ohio) Power & Light Company. The cost as of the summer of 1919 averaged $6.36 per kva. of rated transformer capacity installed.

The substation is about 500 ft. from the Millers Ford station, from which it is controlled and fed with three-phase energy at 6,800 volts. The low-tension oil circuit breakers are part of the feeder equipment of this station, and energy is delivered from them to the low-tension side of the transformers by two 350,000-circ.mil, three-conductor sector cables for each bank.

The current transformers on the high-tension and low-tension sides of the transformer banks have current ratios inversely proportional to the voltage ratios and are differentially connected to inverse-time-limit, definite-minimum, induction-type relays, so that in case of trouble between the low-tension and high-tension oil circuit breakers the relay will trip both switches, clearing the fault, but will render both the high-tension and the low-tension switches non-automatic in case of trouble on the feeders. The feeder breakers, however, are automatic, the bushing-type current transformers being connected to inverse-time-limit, definite-minimum, induction-type relays.

The station is so designed that each feeder may be operated independently from its own set of transformers, or the transformer banks may all be operated in parallel and the feeders fed from a common bus. A spare feeder equipment in No. 1 bay enables any feeder


Outgoing Feeders
Lightning Arrester
Transfer Bus No. 3/0 B.&S. Bare Cable
Bay 4
Bay 3
Bay 2
Bay 1
Choke Coils
200 A Series Ammeter
Auto Oil Circuit Breaker 37000 V. 400 A.
Feeder Transfer
33000 V. Main Bus No 3/0 B.&S. Bare Cable
Auto Oil Circuit Breaker 37000 V. 400 A.
Transformer Bank 3-2000 KVA. 6600/33000 V. 60-Cycle Transformers Delta-Delta
Underhung S.P.S.T. 15000 V. 600 A. Disc Switch
500000 CM. Bare Cable
End Bell
Double Cable from Indoor Station 350000 CM. Cable Sector
Note. All disconnect switches on 30,000 volt circuits are T.P.S.T. 45,000 V. 300 Amp
Bays 21 ft. Wide by 48 ft. Long

OUTDOOR SUBSTATION RATED AT 18,000 KVA., 6,800/33,000 VOLTS

oil circuit breaker to be removed from service for inspection or repairs without an interruption to service.

Under usual conditions of operation oil circuit breakers *A*, *B* and *E* (see diagram) and disconnecting switches *C* and *D* are closed. The transfer breaker *X* and disconnecting switches are open, and all transformers are in parallel on the main bus from which all feeders are energized. During storm periods, however, all transformer banks are energized, disconnecting switches *C* are opened, and each feeder is operated on its own transformer bank, so that in case of a short circuit or flash-over the transformer capacity feeding into the fault would be only 6,000 kva. instead of the full substation capacity.

Any feeder breaker may be removed from service by closing the disconnecting switches on both sides of the transfer feeder oil circuit breaker, closing disconnecting switch on the feeder the oil circuit breaker of which is to be inspected or repaired, and then opening the disconnecting switch on each side of the feeder oil circuit breaker to be removed from service.

Equipment for 18,000 kva., which is the first half of this substation, was erected at a cost of about $114,500, or $6.36 per kva., as shown in the table appended. It contains the following equipment: Nine 2,000-kva. 6,800/33,000-volt, single-phase, water-cooled transformers; three 35,000-volt, 400-amp. solenoid-operated oil circuit breakers with bushing-type current transformers for high-tension switching; three similar oil circuit breakers with the addition of three series ammeters for the three outgoing 33,000-volt, three-phase feeders; one similar oil circuit breaker for the feeder transfer equipment, and three 35,000-volt ungrounded-neutral electrolytic lightning arresters, one for each outgoing feeder. Remote manually controlled disconnecting switches are provided for disconnecting the various pieces of equipment from the line, the operating handle in all cases being brought to a uniform distance above ground for manual operation.

There is a broad-gage track and transfer truck in front of the transformer foundations for moving equipment from the transformer pad to the hoist and to the railroad siding just back of the hoist.

COST OF 18,000-KVA., 6,800/33,000-VOLT OUTDOOR SUBSTATION

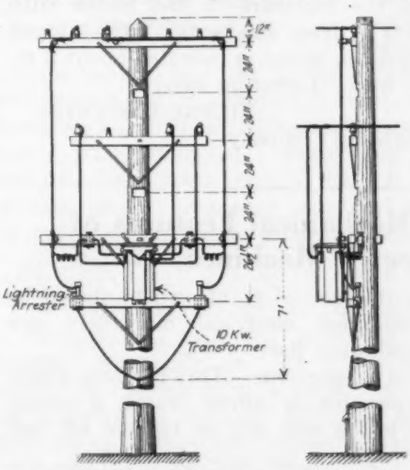
Foundations and superstructure, including transformer hoist, transfer truck and track	$16,259.02
Equipment, including nine 2,000-kva., 6,800/33,000-volt, one-phase, 60-cycle water-cooled transformers, switching equipment, switchboard, cables, pump house, well and pump	93,960.96
Engineering and supervision	4,279.63
Total cost first half of substation	$114,499.61
Average cost per rated kva.	$6.36

On account of the impossibility of getting a considerable number of control cables into the switchboard room of the generating station, some thirty-five-conductor cables were provided from the switching bay to a junction box in the substation.

W. SHULER,
Electrical Engineer,
Dayton (Ohio) Power & Light Co.

Mounting Lightning Arresters Close to Transformers

LIGHTNING arresters protecting transformer installations should be installed as near the transformer as possible. The method shown in the illustration allows placing the arrester on the transformer pole without subjecting the linemen to the danger of a ground wire on the same pole with a transformer. The short arm ordinarily used at the lower end of the transformer hangers is lengthened to provide support for the arresters, and the ground-wire connection is carried far enough down the pole to prevent the lineman from coming into contact with it and the primary wiring at the same time. All vertical wiring is placed on the face of the pole and the rear is kept clear for working space. The method also has the advantage of providing the most direct path through the arrester to ground as the number of sharp bends is a minimum. While the coil in the connection to the fuse box provides some choking effect its main purpose is to provide extra conductor length in case of breaks due to damage by fuse-box binding screws and handling of the connections.



STRAIGHT SHORT PATH THROUGH ARRESTER PROTECTS TRANSFORMER

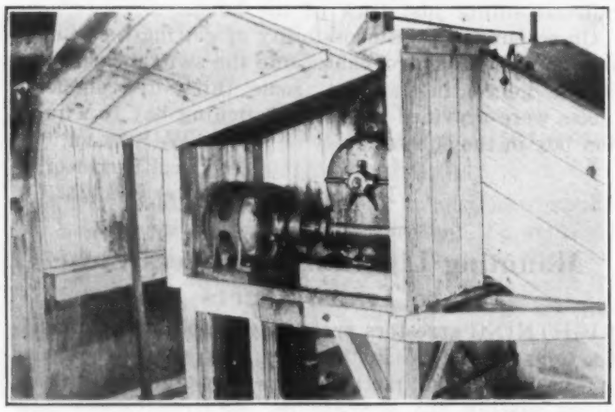
R. A. HAMMOCK,
Superintendent of Distribution.
Denver (Col.) Gas & Electric Company.

Industrial Applications

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

Weatherproof Compact Motor Mounting on Conveyor

A COMPACT and accessible motor mounting at the top of a conveyor is shown in the accompanying illustration. The motor is mounted in a housing at the side of the conveyor, which it drives by worm gearing and spur-gear connections. Minimum space is required



HOUSING FOR MOTOR ON CONVEYOR HAS SLANTING ROOF AND HINGED DOOR

for this drive, and the inclosure of the motor with slanting roof protects it from salt water. The hinged door and the fact that the motor is mounted about 3 ft. above the floor level make inspection easy.

EUGENE CARPENTER.
Cape & Vineyard Lighting Company,
Falmouth, Mass.

Desirable Mechanical Features of Electric Machines

IN GENERAL the mechanical points which should be studied in investigating electrical machinery are summed up in the following list:

1. Good mechanical proportions. This includes ample bearings readily renewable, a sturdy frame, a strong shaft, strong bolts which will not be twisted off and similar details.

2. Good finish. This is important because good finish usually is put on good material. By good finish is meant a workmanlike finish. Highly finished small parts, such as are used on an automobile, would be out of place on a motor or generator.

3. Simplicity. Simplicity involves small numbers of parts, and these of easily understandable form and application, so that an ordinary workman can readily take the machine apart and reassemble it.

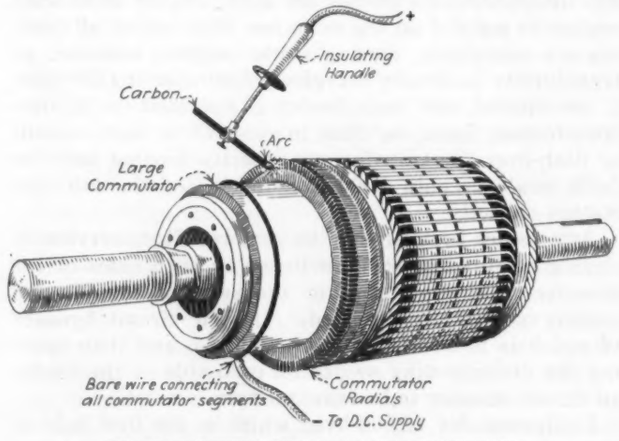
4. Operating attention. The less attention required the better. Proper attention concerns self-feeding brushes, a good but simple oiling system, bearings designed so they will not throw oil, well-fitted bolts, screws and nuts with proper devices to keep them tight when once set up, good connections and good arrangements for keeping dirt out of the vital parts.

5. Accessibility. The machine must be designed so that its operating parts can be easily and quickly inspected, and so that if renewals or replacements are to be made time will not be wasted. Nuts requiring special spanners or wrenches, inconveniently placed screws and similar complications should be rigidly excluded.

6. Interchangeability. This point needs no explanation. The day of the hand-built, made-to-order machine is over. Interchangeability goes with standardization, and these mean sustained quality. JAMES DIXON.
Reliance Electric & Engineering Company,
Cleveland, Ohio.

Soldering Large Commutators by Electric Arc

THE difficulty usually encountered in soldering very large commutators may be diminished by heating the commutator connections with a small electric arc. An arc of approximately 5 amp. at 125 volts direct current has been found satisfactory for this purpose. The intensity of the arc can be regulated with an adjustable rheostat. For use in this process the writer has constructed an electrode holder with an insulating handle as shown in the accompanying drawing. The electrode used is a carbon rod, an arc-light carbon serving well. This



SMALL ELECTRIC ARC USED FOR SOLDERING HEAVY COMMUTATORS

holder is attached to a flexible lead which is connected to the positive side of the direct-current line. The negative connection is made by means of a bare wire wrapped two or three times around all the commutator bars. If the arc is regulated to the proper size, a very rapid and clean job is possible. Care should be taken not to use an arc so large that it will burn the risers.

The use of such a method will eliminate much of the trouble usually encountered in soldering heavy connections to heavy strap conductors. Even with extra-heavy soldering irons of special shape, soldering large commutators is usually a very slow and tedious undertaking.

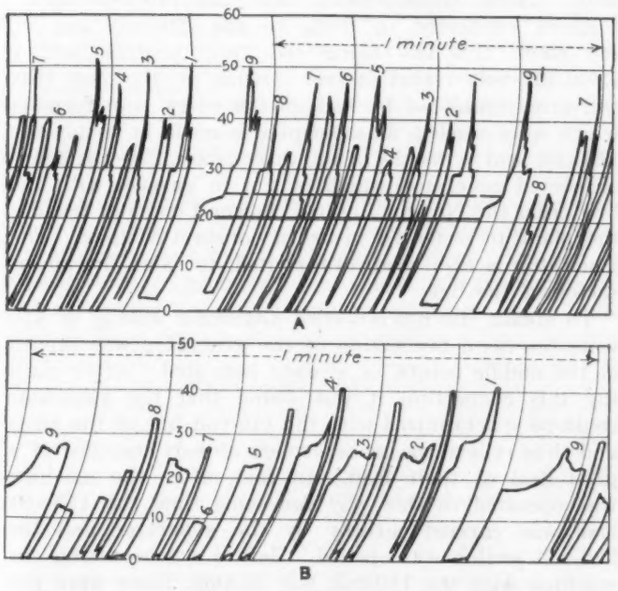
Trail, B. C., Canada. R. H. N. LOCKYER.

Automatic Controller Operates Blooming-Mill Lift Tables Successfully

AN AUTOMATIC controller for the motor drive of the rollers of the lifting tables of a 40-in. blooming mill in one of the largest Pittsburgh steel works has given very successful service. After three makes of automatic controllers had been used, with all the well-known troubles usually encountered in this application, a type which had given good service in smaller applications was tried with success. The blooming mill in question rolls ingots weighing 5,200 lb. and measuring from 16 in. to 18 in. square in section. The advantages of the controller lay in its reliability, simplicity of parts and operation, small number and interchangeability of parts and ease of making adjustments to obtain the desired results.

The ingots are rolled in nine passes which produce the bloom sizes given below. By mechanical means the ingot is manipulated between certain passes as indicated:

First pass—15 in x 18 in.
Second pass—13 in. x 18 in., edge up.
Third pass—13 in. x 15 in..
Fourth pass—13 in. x 13 in., edge up.
Fifth pass—11 in. x 13 in.
Sixth pass—11 in. x 11 in., edge up.
Seventh pass—11 in. x 9 in.
Eighth pass—9 in x 9 in., edge up.
Ninth pass— 9 in. x 9 in., to 28-in. mill.

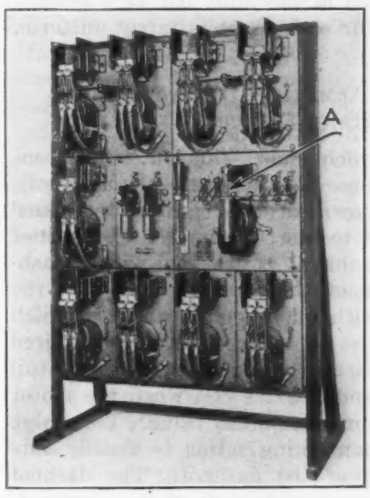


RAPID REVERSALS IMPOSE SEVERE DUTY ON MILL-TABLE CONTROLLERS

The top curve shows operating conditions as first recorded, while the lower curve shows conditions after adjusting the resistance steps. The curves were taken with a 100-millivolt, 2,000-amp. shunt on a 220-volt circuit.

The time of rolling the nine passes is from fifty seconds to sixty seconds. The table rollers are rotated by means of two 100-hp., 220-volt Crocker-Wheeler motors. As these two series motors are connected in parallel so as to be operated by a single set of reversing switches, the service is severe on the controller.

The accompanying illustration shows the 200-hp. Rowan automatic full-speed reversing controller which has been in use about half a year. It operated in continuous service for three weeks before the first change in arcing tips. The rapidity with which the switches must make and break contact may be appreciated after a study of the ammeter curves. The arcing tips and the arc shields on the controllers formerly used had to be changed about twice as frequently as those on the present board. The blooming-mill time delay charged against the electrical department varies almost directly with the number of times that the parts of the controller board have to be changed. The first arc shield to be replaced was of defective material and had to be changed after two months of service. Those who are familiar with the maintenance of contactor panels on this sort of application will realize the great improvement provided by this controller in the life of the parts mentioned.



LIFTING TABLE CONTROLLER WHICH IS ACTUATED BY ACCELERATING RELAY (A)

As this controller was the first of its type and size to be used, it is natural that a few weak points should come to light. The knife switch provided on the board, connected in series with one of the motor circuits to permit of testing the board without turning the motors, and the flexible leads on the circuit breaker were not of sufficient current-carrying capacity. Moreover, the piston rod in the dashpot of the accelerating relay contained a weak spot. These features have now been taken care of by the manufacturer of the controller so that new boards of this relative size will not give rise to the same troubles.

ENERGY CONSUMPTION 1.5 KW.-HR. PER INGOT

This controller has been in constant operation since its installation, with the exception of a very few minutes. To obtain an idea of the amount of power handled by the controller a 1,000-amp. watt-hour meter was connected in the line. From 11 a.m. on a Monday until the same time the following Saturday the meter registered 7,430 kw.-hr. During that time there were 4,887 ingots rolled. The next full week 7,810 kw.-hr. was used, and the following week 7,930 kw.-hr.

From the above, the power per ingot is about 1.5 kw.-hr., and the current would be about 410 amp. This current value is shown on the first-curve chart, from which the root-mean-square value was roughly estimated to be about 500 amp., as indicated. The feed of the first-curve chart was 3 in. per minute, and that of the second was 6 in. per minute, the paper being marked off in ¼-in. divisions.

On the curves the pass numbers are indicated to correspond with the pass numbers given in the above

table. The first curve plainly shows the effect on the current produced by the closing of the accelerating contactors.

After the first curve was made it was desired to secure smoother operation; therefore, the grouping of the resistance elements was changed and adjustments were made on the accelerating equipment, with the results indicated by the second curve, showing a reduction in the current peaks.

Except at the start of the first pass, the current peaks are obtained when plugging to stop motors between passes. Pass No. 8 is made with great caution because of a peculiar characteristic of this mill which makes the bloom liable to turn in the guides upon entering this pass; therefore, the master controller is thrown on and off a number of times during the pass. The individuality of the operator is, of course, somewhat reflected in the operation of the mill; but as a general rule the current cycle for each ingot is fairly uniform, as the curves show.

ACCELERATING ARMATURE DASHPOT AN IMPORTANT FEATURE

The main feature which makes this automatic controller different from those used before is the accelerating relay which is shown in the right-center panel section. It is similar to the contactors. The chief points of difference are that it is provided with a dashpot to delay the action of the armature and that the armature is provided with a horizontal bar upon which are fixed contact arms so set as to close in the desired sequence. This armature is actuated by a shunt coil which is bucked by a small series coil when the motor current reaches a high predetermined value. This value is so chosen that the dampening action is usually only the result of the drag of the dashpot. The dashpot is, therefore, a very important feature of the accelerating relay. As there has been no splashing of oil, the use of the dashpot has not proved objectionable.

The current through the circuit-breaker coil may be traced from one side of the line to the other even when the master controller is on center position. The circuit breaker therefore stays closed instead of opening and closing with every movement of the master switch. Of course, in case of an overload the breaker will open because of the action of the relays in the magnet circuit. In case of voltage failure, when the master switch is off center, the breaker will open. With the master controller returned to center the circuit breaker will reset whether it had been opened by overload or undervoltage.

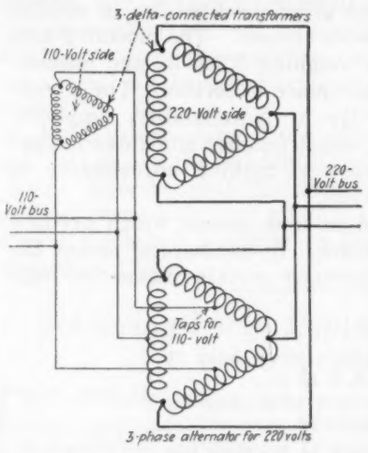
Upon throwing the master switch one way or the other the corresponding contactors at the top of the controller are closed. The closing of these contactors provides a circuit for the flow of current through the shunt coil of the accelerating relay, and the pull of this coil starts the action of the relay.

There is one more contact arm on the accelerating relay than there are accelerating contactors on the board. This extra arm is the first to make contact. Its function is to provide an additional interlock between the forward and reverse contactors. The interlocking is done by the connecting of a resistance in parallel with the contactor coils so as to rob them of part of their current and thus prevent the contactors from closing. This resistance is of such value as to avoid causing the opening of closed contactors because of the reduction of current flow. If desired, the electrical interlocking may be made inoperative by changing the angle at which the little contact arm is fixed to the accelerating relay. As the accelerating relay closes one little contact after another, the magnet coils on the corresponding accelerating contactors are excited, and as a result the starting resistance is cut out a step at a time.

D. W. BLAKESLEE,
Pittsburgh, Pa. Electrical Engineer.

Use of 220-Volt Alternator for Delivering 110-Volt Energy

TO GET energy at 110 volts from a 220-volt alternator taps were made at the middle point of the delta winding of the alternator, as shown in the accompanying diagram, and thus the machine was enabled to carry 110-volt load when transformers for cutting the voltage down to 110 volts were not available. The necessity for operating in this manner was caused by the growth of the 110-volt load in the plant of the Curtiss Aeroplane & Motor Corporation, Garden City, Long Island, N. Y., during war time. This load grew to such an extent that the transformers used to feed it were not of sufficient size. These transformers were 220/110-volt transformers connected in delta to the 220-volt bus of the plant, this bus being fed from another set of 6,600/220-volt transformers. Owing to the fact that deliveries could not be had on the extra transformers which were needed, an attempt was made to supply the 110-volt load by means of the three-phase, 220-volt delta-connected generator which is run in parallel with the line from the Nassau Light & Power Company feeding the plant in order to insure a constant voltage. The generator is also used, overexcited, to raise the power factor of the line.



TAPS TAKEN FROM 220-VOLT GENERATOR TO SUPPLY 110-VOLT LOAD

To obtain the much-needed additional energy at 110 volts the delta connection of the generator was tapped at the middle points, as already indicated. After making this connection it was found that the generator could be synchronized with the 110-volt bus of the plant and thus relieve the transformers already installed of a good deal of their load. In fact, after the machine was operated in this way for some time the 110-volt load was carried entirely by the generator and the 220-volt switch was opened. Before synchronizing the machine with the 110-volt bus 10-amp. fuses were put in the machine circuit on the 110-volt side in order to prevent serious damage in case the machine could not be synchronized. It was, however, synchronized satisfactorily, and consequently permanent lines were installed through a 200-amp. switch.

Of course, it must be remembered that the output of the generator from these 110-volt taps is only half what it would be from the 220-volt leads of the machine. This machine was not overloaded, as it actually carried

only 60 kw. constantly, although it is an Allis-Chalmers 150-kw. turbo set.

W. E. TATEM.
Curtiss Aeroplane & Motor Corporation,
Garden City, N. Y.

Power Requirements in Sawmills

THE sizes of motors used in the ordinary sawmill for different operations are given here in Table I. The second table shows the power consumption in mills handling different kinds of timber. In estimating the power to be used in sawmills two factors to be remembered are the form of the finished product and the hardness of the wood. These factors have a wide bearing on the amount of power required. Sawmill and woodworking machines are almost always driven by squirrel-cage induction motors, although hand mills, heavy band resaws, etc., which require a large starting torque, are driven by wound-rotor machines. The energy is commonly 60-cycle, three-phase, furnished at 480 volts or 600 volts.

As a general rule heavy and sudden peaks are encountered, and allowance must be made in selecting motors. It is found that as an average the load factor of the entire mill is about 60 per cent of the total name-plate rating of the motors.

Allan E. Hall, Allis-Chalmers Manufacturing Company, presented these facts at a recent meeting of the American Society of Mechanical Engineers.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

TABLE I—SIZES OF MOTORS FOR DIFFERENT OPERATIONS IN SAWMILLS

Machine Operated	Motor Size (Hp.)
Log jack, for hauling logs into the sawmill	25 to 50
Circular log cut-off saw, for dividing long logs after being drawn into the mill	25 to 50
Drag saw, for cutting off logs too large for the circular saw above mentioned	15 to 40
Overhead log canter, for turning large logs lying on the log storage deck or on the carriage	10 to 20
Band mill, for ripping the logs which are moved back and forth in front of it on the carriage	100 to 300
Circular head saw, sometimes used instead of band mill	100 to 400
Power setting machine, for moving log forward after every cut into position for the next cut. This machine is mounted on the carriage. Two types are used, one direct steam-driven, the other power-driven The latter is used exclusively for the heaviest work, and motor may be mounted on carriage	5 to 10
Live rolls, or power-driven rolls, for transporting lumber after being sawed. These are connected and driven together in trains of six to twenty or more, according to the mill design; power required per roll	0.4 to 0.6
Band resaw for further reduction of large piece dropped by the head-band mill. It may be either vertical or horizontal. The latter is used for resawing slabs as well as splitting thick stock from the head band	75 to 200
Transfer chain tables, for moving lumber sidewise between machines. These are of such varying length and width according to the individual case that no power requirement can be specified.	
Gang mill, for sawing entire log into boards at one passage through the machine. Two opposite slabs are taken off the log by the head-band saw, giving the log two flat faces, after which it is fed to the gang	50 to 400
Edger, for ripping bark edges from the boards and squaring them	15 to 250
Slab slasher, for dividing waste stock into short lengths for lath, stove-wood or other by-products	20 to 75
Trimmer, for cutting ends off boards and making them of standard length	20 to 75
Swing cut-off saw, for hand-trimming of large timbers, etc	10 to 25
Timber sizer, for surfacing two or four sides of timbers at one operation	50 to 60
Lath bolter, for preparing lath bolts from slabs or other waste wood	30 to 60
Lath machine, for making lath from bolts	20 to 30
Hog, a grinder with knives on a revolving disk, for chipping waste wood for fuel or other purposes	25 to 150
Planers, of great variety in size and type. The largest standard size requires about 75 hp.	
Exhaust fans, for transporting dust and shavings from planers to fuel storage house	25 to 150
Chain conveyors, for transporting waste wood and sawdust, the length varying with the mill design up to about 350 feet	5 to 30

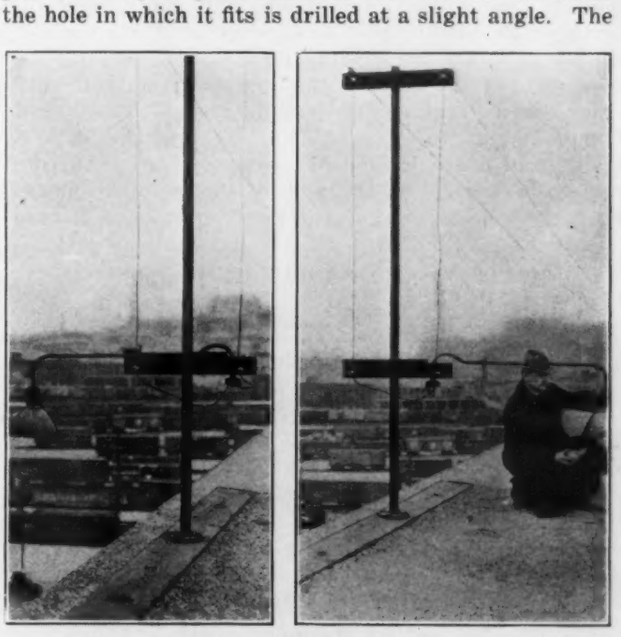
TABLE II—POWER CONSUMPTION OF VARIOUS SAWMILLS

Drive	Timber	Amount of Lumber Sawed in Ten Hours (Ft. B. M.)	Average Horsepower	Horsepower Required per 1,000 Ft. of Lumber Sawed per Ten Hours
Electrical	Sugar pine	107,000	470	4.39
Electrical	Fir	140,000	600	4.28
Electrical	Yellow pine	225,000	1,090	4.87
Electrical	Fir	125,000	600	4.80
Electrical	Mixed hardwood	85,000	672	7.90
Electrical	Yellow pine	190,000	2,140*	11.26*
Electrical	Fir	115,000	1,260*	10.96*
Electrical	Fir	121,000	1,152*	9.52*
Mechanical	Sugar pine	114,000	610	5.36
Mechanical	Yellow pine	175,000	1,014	5.86

* Power for entire plant, including planing mill.

Home-Made Swinging Reflector Arm for Safe Maintenance

TO INSURE safety to men replacing lamps which overhang the edge of the roof and to afford firm support to the lamps in heavy gales a contrivance which allows the lamps to be swung over the roof was after some experimentation adopted by the Graton & Knight Manufacturing Company, Worcester, Mass. Outside illumination of that portion of the yard adjacent to the factory building is provided by 200-watt gas-filled lamps mounted in Wheeler reflectors attached to pipe arms carried near the edge of the roof, as shown in the photograph. The lamps are about 75 ft. above ground and extend about 2 ft. beyond the roof. Each lamp is fed and supported by a ½-in. pipe bent at the inner end and carried through a vertical hole in a 3-in. x 4-in. cross-arm strapped to a vertical 2-in. pipe standard 10 ft. high. About 3 in. from the outer end of the arm a ½-in. coach screw is used as a pin to wedge the pipe bracket against a block of wood about ¾ in. wide and of the same height mounted on top of the arm. This block forms a backing against which the pipe lies when swung outward over the roof. To insure that the pin shall stay in place under severe weather conditions the hole in which it fits is drilled at a slight angle. The arm, as shown, swings about on the vertical portion of the pipe for inspection and lamp maintenance. Energy is supplied from an overhead line fed into the bracket through a condulet. The upright standard is fastened with a flange into a horizontal plank, which in turn is fastened into the roof timbers below the gravel surface.



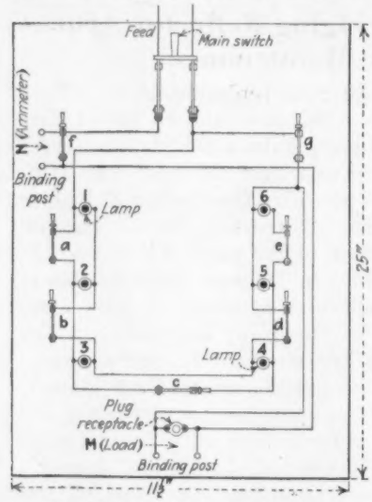
OVERHANGING LAMP IS SWUNG IN FOR CLEANING AND RENEWING
Pipe support is fitted in hole in cross-arm

Graton & Knight Mfg. Co.,
Worcester, Mass.

A. H. MAGNUSON,
Electrical Engineer.

Simple Board for Testing Small Equipment

A SIMPLE and inexpensive lamp board which will be found useful around an industrial plant may be made as outlined in the accompanying diagram. With such a board fitted with six 200-watt lamps and connected to a 110-volt line the writer has obtained current varying from 11 amp. to 0.36 amp. The resistance at the same time changed from about 300 ohms to 10 ohms. As shown in the diagram, there are six lamps, numbered 1 to 6, mounted on a board 25 in. x 11½ in. The feed line is led into the top of the board, and one side of the line passes straight through to the load post *M* with an ammeter inserted at *N*. The switch *f* is used for short-circuiting these ammeter binding posts. The other side of the line passes through the lamps, the current passing through more or less lamps in series and parallel according to the position of the knife-blade switches *a*, *b*, *c*, *d*, *e*. The switch *g* is used to short-circuit these lamps and put current directly on the binding post *m*. A screw-plug receptacle is connected across the binding post *M*. By varying the position of the switches as the accompanying table indicates, the current at the binding post *M* is changed from 0.36 amp. to about 11 amp. The switches *a*, *b*, *c*, *d*, *e*, *f* and *g* are 15-amp., 125-volt switches. All connections are made on the back of the board by means of back-connected switches. For convenience a snap switch may be used for the main switch, although this is not advisable if large lamps are to be used and energy is to be on for any length of time, because the heat from the lamps may soften the switch button so that the switch cannot be operated. This objection may be overcome by mounting the switch at the bottom of the board. With nitrogen lamps it is well to use diffusing caps to eliminate the discomfort which will result from glare.



HOMEMADE BOARD FOR TESTING SMALL EQUIPMENT

POSITION OF SWITCHES FOR DIFFERENT CURRENTS AND RESISTANCES

Amp. with Terminals *M* Short-Circuited	Resistance in Series, Ohms	Switches Closed
0.36	303	None
0.52	272	*e*
0.61	182	*d*
0.73	151	*c*, *e*
0.78	141	*c*, *d*
0.81	136	*c*, *d*, *e*
0.91	121	*a*, *b*, *d*
0.99	111	*b*, *c*, *e*
1.82	61	*b*, *d*
3.64	30	*a*, *c*, *e*
5.46	20	*a*, *b*, *d*
7.28	15	*a*, *c*, *d*, *e*
9.1	12	*a*, *b*, *c*, *d*
10.9	10	*a*, *b*, *c*, *d*, *e*

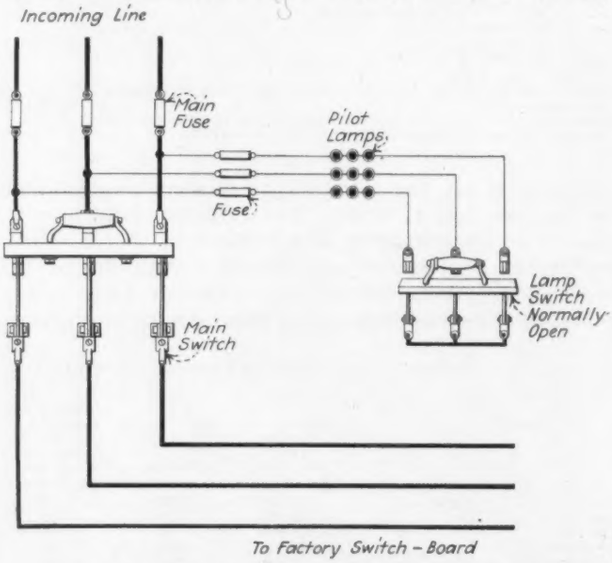
This board has been used by the writer for various purposes, among which are charging storage batteries, testing fuses, lamps and coils of low or medium resistance for open circuit, testing ammeters, making current tests of small appliances which operate at a voltage equal to that of the lamps, and testing extension lights or portable tools, such as drills or grinders. By connecting these appliances in series with several lamps in multiple they may be tested without danger of blowing a fuse or damaging the appliances if they are short-circuited.

A. H. PLATT.

Bridgeport, Conn.

Pilot Lamp to Indicate When Service Is Cut Off

IN ORDER to determine when some circuit in the factory goes dead, whether the power company's service has failed or whether the trouble is inside the factory, pilot lamps such as are shown in the accompanying drawing will save considerable time. The connection for these lamps is taken at the main low-tension switch as near the blades as possible and on the service side of the switch. A small fuse is installed near the main switch, and a No. 14 wire, two, three or four-conductor, according to the system, is run to the signal lamps placed at any convenient point in the factory. A sufficient number of lamps must be used to stand line voltage $\div \sqrt{3}$. A three-pole switch is connected in order to short-circuit the lines, as shown, at any point which can be quickly reached by an operator who notices that energy has failed. If desired, more than one of these switches may be installed, they being placed at different points in the factory. When the power goes off, on closing this switch the lamps will light at full candlepower if the service from the incoming line is complete up to the factory's entrance switch. If the incoming service is entirely cut off, they will not light. If one phase of the service is cut off, two sections of the lamps will burn, but not at full brilliancy.



PILOT LAMPS USED IN FACTORIES TO TELL WHERE POWER HAS FAILED

By the use of such lamps it is possible to ascertain whether the trouble is in the factory or outside of the factory and whether or not to call the power company.

East Berlin, Conn. H. S. RICH.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

Attractive Booklet Tells Consumers of Company's Aims and Achievements

AN INTERESTING booklet entitled "The Spirit of the Age" has been recently issued by the Depew & Lancaster (N. Y.) Light, Power & Conduit Company to inform its customers of the scope and aims of the company. A brief description is given of the influence of electric service upon the development of civilization and of the conveniences it now affords. Following this is a story of the evolution of the company since it was started some twenty years ago as a small plant in the rear of a dry goods store to light the premises. It now supplies service to an estimated population of 75,000 in twenty-two towns and villages. Numerous views of the company's property and its facilities for service are shown in the booklet, which is about 8 in. x 10 in. in size and carries the attractive cover shown in the accompanying cut.

AN EFFECTIVE MEDIUM OF PUBLICITY

E. Feyler, who installed the original plant, is now president-treasurer of the Depew & Lancaster Light, Power & Conduit Company.

Merchandising in Small Communities

IN COMMUNITIES which are too small to warrant the company distributing electric service maintaining an office the Scioto Valley Traction Company, Columbus, Ohio, makes a local hardware dealer its agent for the sale of electrical merchandise and for the collection of bills. The company supplies the necessary stock, advertises the merchandise in the local newspaper and carries the time-payment accounts. The hardware dealer is thus relieved of investment, advertising expense, and the liability of carrying accounts. The line of electrical merchandise and the central-station advertising bring people to the store, and the central-station company pays the dealer 10 per cent commission on all the electrical merchandise he sells. When the merchant also acts as a collection agency for the company he is allowed 5 per cent of the amount collected.

The company first tried to negotiate with electrical contractors and dealers, but they expressed dissatisfaction with the amount of the commission, did not have suitable stores in which to display appliances, or preferred to push the sale of farm-lighting plants in competition with central stations. The arrangement was then made with the hardware dealers and has been found very satisfactory in communities of from 250 to 1,200 inhabitants.

Brooklyn Utility to Have Consumer and Employee on Directorate

STEPS to have a representative of the public and an employee of the company on its board of directors are being taken by the Kings County Lighting Company, a utility supplying gas in a southern section of Brooklyn, N. Y., having a population of approximately 250,000. This action, which has grown out of a long series of rate hearings whereby the company was successful in obtaining a rate for service which would attract new capital for needed extensions, is part of a program laid out by Ralph Elsman, president of the company, for a better understanding with consumers.

In order that the company could adequately serve its customers the Public Service Commission issued an order requiring it to make improvements and extensions costing upward of $2,000,000, these improvements representing expansion, deferred by war conditions and the rate litigations. Application was made to the commission for the approval of $2,000,000 of 8 per cent preferred stock. After several hearings such approval was granted, and the stock is now being offered primarily to consumers and residents of the district supplied by the company. In addition, Mr. Elsman has announced his intention of having on the board of directors a representive of the consumers, chosen by themselves, and a representative of the employees of the company. He has also invited the civic associations and local newspapers of the district each to designate a representative to serve on an advisory committee to the company to take up complaints directly, to determine on a method whereby a director-representative of the consumers may be chosen and to suggest any other measures that the company may adopt that will be helpful in bringing about closer co-operation between the company and its community.

In proposing this arrangement the following letter was addressed to the civic bodies and newspapers of the section:

TO CIVIC ASSOCIATIONS.—In November, 1920, when I acquired control of the Kings County Lighting Company, I promised that the facilities would be enlarged, the plant capacity increased, the quality and quantity of gas increased, street mains and house services laid and meters set. Contracts were immediately let. The plant capacity has now, within less than two months, been increased by over 2,000,000 cu.ft. a day, so that, with a total capacity of 11,000,000 cu.ft. per day, the plant will be able to furnish

every one this winter with gas of a good quality and pressure.

There were 12 miles of mains and services to be laid, and 70 per cent of this work is now done. Likewise, the forces of the company began setting meters, and over 500 applicants for meters have now been taken care of. As to the improved quality of gas, I am sure every consumer has noticed the very great improvement.

Briefly, between $500,000 and $600,000 has thus been expended in two months to improve the company's property and to benefit its consumers. Incidentally such improvements would not have been possible if the company had not been able to secure a higher gas rate.

You will realize that getting these improvements done has occupied very fully the time and energies of the officers of the company. The work has now reached the point, however, where I want to take up additional matters. After the new rate went into effect, I promised the improvements referred to above, and I stated that I intended to have a representative of the public and of the employees on the board of the company.

I have not yet been able to determine the best method that should be followed in the selection of the public representative. At the same time I realize that, hard as has been the work of the contractors and the officers and employees of the company, all causes of complaint have not been met. Consequently, may I suggest that an advisory committee be formed, made up of representatives of the various civic organizations of the district? Such a committee will thus be able to take up directly three classes of questions—first, any complaints in the different sections of the district; second, discussion and recommendation of a method that seems most satisfactory to all for the selection of a representative of the public to serve as a director of the company; third, any other matters whereby the company may aid in the prosperity and upbuilding of this district.

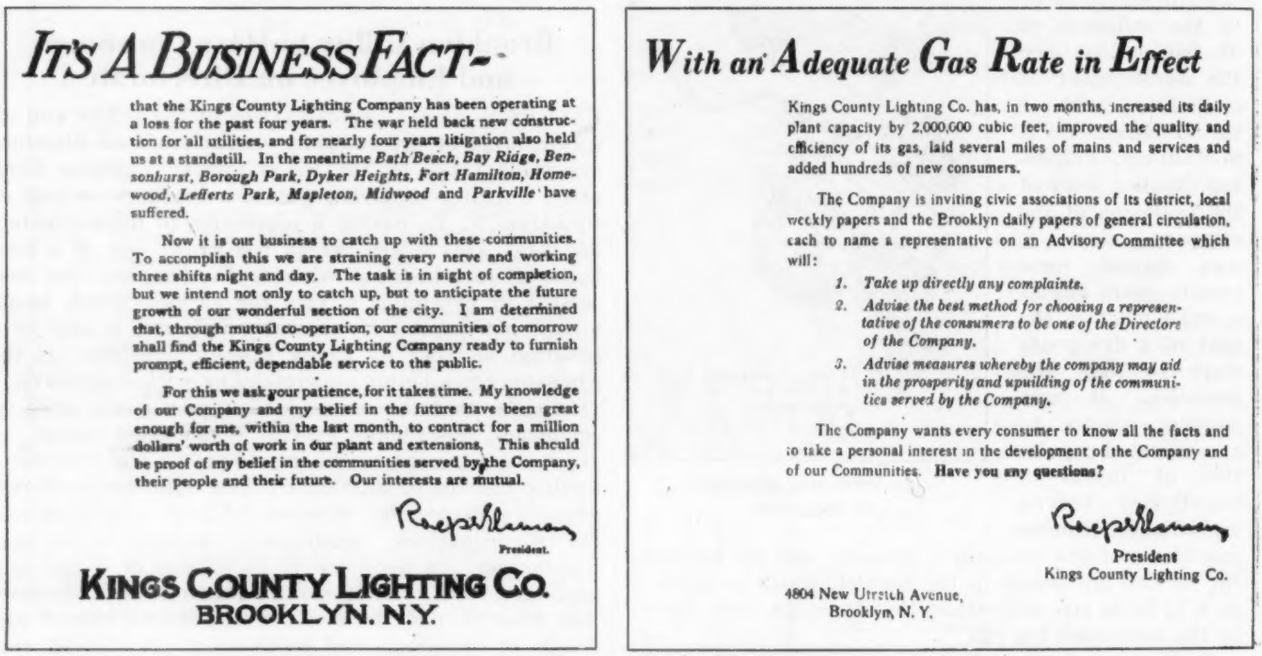
I consider that, by reason of its natural advantages and of the four rapid-transit lines, this district is destined to have, by comparison with any other part of Greater New York, a greater growth and a resulting prosperity to our property owners, builders, storekeepers and public generally.

As the company is anxious to have the assistance and advice of such a committee at the earliest moment, may I suggest that you, as president of your association, be a member of such committee or designate a representative? In addition, I am asking the weekly papers in this district and the Brooklyn papers of general circulation each to name a representative to serve on this committee. Yours very truly,

RALPH ELSMAN, President.

In addition an active campaign, of which two typical advertisements are shown here, is being carried on in the local newspapers and Brooklyn papers of general circulation and in the New York metropolitan papers, setting forth the policy of the company, the advantages of its territory for residents and the accomplishments possible as the result of obtaining an adequate rate. The company is sending two or three pamphlets to each of its 40,000 consumers and prints a statement of the purposes of the company on the back of its gas bills. It also places a sticker on the front of the gas bills, the text of which is changed every week. The company is thus endeavoring to bring home to its consumers the direct relationship that exists between an adequate rate that pays operating expenses and a reasonable return and the expansion of a territory served.

Associated with Mr. Elsman in relation to the company is Travis H. Whitney, who served for nine years as secretary of the Public Service Commission of the First District of New York and three years as a commissioner, the last five months of which he was chairman of the commission.


IT'S A BUSINESS FACT—
that the Kings County Lighting Company has been operating at a loss for the past four years. The war held back new construction for all utilities, and for nearly four years litigation also held us at a standstill. In the meantime Bath Beach, Bay Ridge, Bensonhurst, Borough Park, Dyker Heights, Fort Hamilton, Homewood, Lefferts Park, Mapleton, Midwood and Parkville have suffered.
Now it is our business to catch up with these communities. To accomplish this we are straining every nerve and working three shifts night and day. The task is in sight of completion, but we intend not only to catch up, but to anticipate the future growth of our wonderful section of the city. I am determined that, through mutual co-operation, our communities of tomorrow shall find the Kings County Lighting Company ready to furnish prompt, efficient, dependable service to the public.
For this we ask your patience, for it takes time. My knowledge of our Company and my belief in the future have been great enough for me, within the last month, to contract for a million dollars' worth of work in our plant and extensions. This should be proof of my belief in the communities served by the Company, their people and their future. Our interests are mutual.
President.
KINGS COUNTY LIGHTING CO.
BROOKLYN, N.Y.
With an Adequate Gas Rate in Effect
Kings County Lighting Co. has, in two months, increased its daily plant capacity by 2,000,000 cubic feet, improved the quality and efficiency of its gas, laid several miles of mains and services and added hundreds of new consumers.
The Company is inviting civic associations of its district, local weekly papers and the Brooklyn daily papers of general circulation, each to name a representative on an Advisory Committee which will:
1. Take up directly any complaints.
2. Advise the best method for choosing a representative of the consumers to be one of the Directors of the Company.
3. Advise measures whereby the company may aid in the prosperity and upbuilding of the communities served by the Company.
The Company wants every consumer to know all the facts and to take a personal interest in the development of the Company and of our Communities. Have you any questions?
President
Kings County Lighting Co.
4804 New Utrecht Avenue,
Brooklyn, N. Y.

TYPICAL ADVERTISEMENTS WHICH ARE GAINING FRIENDS FOR THE KINGS COUNTY LIGHTING COMPANY

Pacific Gas & Electric Sells $1,374,000 Stock in Twenty-four Days

BETWEEN Jan. 1 and Jan. 24 the Pacific Gas & Electric Company, San Francisco, sold $1,374,000 of its preferred stock to its consumers. This high rate, reaching an average of $68,700 per business day, has been due to an energetic campaign carried on since July 1, 1920, during which time a total of $5,008,550 of preferred stock was sold to consumers and the general public. Since the company first undertook the sale of stock locally in June, 1914, a grand total of $19,810,050 of stock has been sold, placing a total of 10,273 preferred and 2,839 common stockholders on the books as of Dec. 9, 1920.

Real Owners of Public Utilities

PUBLIC utility executives and managers whose companies are largely owned by out-of-town investors are frequently faced with the accusation that a little coterie of New York financiers control the property. The Merchants' Heat & Light Company of Indianapolis answers the question "Who Owns the Public Utilities?" in an interesting and effective manner as follows:

"Some of us—many of us, in fact—have carried around for a long time a mistaken idea about what kind of people actually own the public utility companies which supply gas, electricity, telephone, street railway and interurban service to millions of men, women and children in almost every part of the United States. Those of us who don't know, or may have been misinformed, are inclined to have and nourish the idea that public utility companies are owned by little bands of capitalists, bankers, and wealthy business men, with here and there a frantic financier or a gentleman crook thrown in to invent ways and means by which the public may be defrauded and a barrel of profit produced every year, or a fancy showing made upon which some 'sucker' can be induced to buy the property at several times its actual cost or value. Some of us who have political aspirations have been inclined to promote and encourage that line of thought, thinking thereby to gain public favor.

WHO THE REAL OWNERS ARE

"Well, you ask, if a lot of us are laboring under a misunderstanding, who are the real owners of the public utilities of the country? They are doctors, lawyers, merchants, teachers, ministers, clerks, stenographers, mechanics, policemen, firemen, railroad men, widows, orphans, and, last but not least, many elderly people whose period of activity is passed and who have invested a part or all of their savings in the bonds and stocks of public utility companies. They are the kind of people who live next door, whom you meet on the street, in business places, in churches, in theaters and actually rub elbows with you every day of your life. Other investors in these properties are life insurance companies, fire insurance companies and savings banks. Every time you pay an insurance premium your money goes into a fund which must be invested in order that the company may earn money with which to carry on its business and meet the obligation in your policy when it falls due. The savings bank pays you interest on your deposit. In order to do this and meet the operating expenses of the bank your money must be invested and made to produce more than the interest you receive. Insurance companies and banks own and hold large amounts of the bonds of public utility companies.

"Every man or woman who has an insurance policy or a savings bank account is, therefore, indirectly vitally interested in having the public service companies of the country carry on their business successfully and profitably.

"The public utility business of the United States is a truly American business—of the people, by the people and for the people—and the profits (if any) are shared by the people. Were it not for the money which has been furnished by the people in almost every walk in life, it would not have been possible for active, energetic men to build the public utility plants, to accomplish what has been done for the comfort and convenience of the millions of people served daily or hourly by these companies. Any honorable concern is entitled to conduct its business on a profitable basis in order that it may render satisfactory service to its customers and pay to its investors a fair return on the money they have invested in it. The public utility company is no exception."

Byllesby Properties Co-operate in "National Thrift Week"

Benjamin Franklin Would Recommend Sound Electrical Investments
FRANKLIN, whose birthday January 17, is being commemorated by National Thrift Week, was one of a few men who founded the United States of America. We owe him the deepest gratitude.
You will recall that Franklin foresaw the wonders of electricity and that he was a great advocate of personal thrift.
In Franklin's time electricity and thrift could not be linked together and made to work hand in hand for the comfort and happiness of men and women. Today we find an extraordinary union of two subjects to which his wisdom devoted much attention.
Who can doubt that this great pioneer in electricity, if alive today would advocate the acquirement of financial independence by the people, by their saving and investing in organizations serving mankind with an ever-increasing supply of electrical energy?
All wisdom does not come from the past, but when the words and deeds of a man live through the centuries, his advice is worth heeding.
Our 7% Preferred Stock affords an ideal opportunity for you to carry out the thrift ideas of Franklin and to further develop the great forces of electrical energy which his investigations helped to bring to us.
Union Light, Heat & Power Co.
610-612 N. P. Avenue—Fargo, N. D.
Ask for our illustrated, descriptive literature.

ABOVE is reproduced one of the advertisements used by the utility properties of the Standard Gas & Electric Company during "National Thrift Week," Jan. 17 to 22, tying this movement in effectually with the customer ownership programs of the Byllesby companies.

To Instruct Public School Students in Rudiments of Utility Operation

EDUCATION of the students of the Jackson (Mich.) public schools in the elementary principles of electric power generation and distribution is being undertaken in co-operation with the Consumers' Power Company. Classes will visit the plants of the company from time to time under the guidance of the company's instruction department, and an effort will be made to give the students an understanding of the utility's work in such respects as will be interesting from a consumer's viewpoint.

In addition, men from the instruction department will address the students at the schools from time to time and demonstrations of the workings of electric and gas meters will be undertaken.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Alternating-Current Generators for Ship Propulsion.—E. H. FREIBURGHOUSE.—The importance of reliability in the design of these generators is brought out and some description follows dealing with the actual design and construction of alternators for such service. Great care is taken to watch the temperature in the various parts of the apparatus, especially since there is such wide variation in the operation of the machine in regard to speed and excitation. Fire-extinguishing apparatus is provided and heating coils are used inside the machine in order to prevent condensation of moisture.—*General Electric Review*, February, 1921.

High-Tension Transformers for X-Ray Work.—RUSSELL S. WRIGHT.—The author maintains that a satisfactory classification regarding either output or efficiency has not been reached, neither has any effective means been found for rating either induction coils or the closed circuit high-tension transformer in terms of their value to the radiologist. The author emphasizes the necessity for co-operation with medical experts in the design of this apparatus.—*Journal Institution of Electrical Engineers* (London), August, 1920.

Phase Compensation for Polyphase Motors.—VAL A. FYNN.—This article is a continuation of a series which the author contributed to the ELECTRICAL WORLD in 1913. In the former series he dealt with phase control in general and with the only method of controlling the power factor in synchronous motors with shunt characteristics which has, he says, become of practical value. In this article he considers other means of controlling the phase difference in non-synchronous single-phase motors and then passes to the phase control of non-synchronous polyphase motors, with numerous wiring and vector diagrams.—*Journal A. I. E. E.*, January, 1921.

Lamps and Lighting

Recent Developments of High-Current Arcs, with Special Reference to Searchlights.—J. PALEY YORKE.—This paper deals principally with the developments which have been made in high-current arcs between plain carbons during the war period and with a method of comparing the relative intensities of searchlight beams at working ranges. The main development of the high-current arc has been in the direction of increasing the current density through the carbons and across the arc gap. It is said to be possible to run plain carbons smoothly and silently at a current density up to 0.31 amp. per square millimeter of area of the positive carbons by means of electromagnetic control. The effects of impregnating carbons in so far as they apply to searchlamps are also described, and the characteristics of the high-current arc are briefly touched upon.—*Journal Institution of Electrical Engineers* (London), August, 1920.

Medical Lighting, Including Hospitals and Dental Offices.—A. L. POWELL AND H. H. ALLISON.—Hospitals as a class are held to be far behind other types of buildings in the matter of adequate lighting. Of one hundred hospitals in New York City visited only two were provided throughout with lighting equipment of the most modern type. Although these hospitals were equipped with the best surgical apparatus, artificial illumination had received practically no attention. The authors take up the hospital and general offices, room by room, to show what the requirements are for such rooms and to suggest suitable apparatus.—*Bulletin L. D. 121, Edison Lamp Works*, November, 1920.

Generation, Transmission and Distribution

Studies in Tidal Power—III.—NORMAN DAVEY.—In this number of the series the utilization of the gross power available is considered, as are the limitations and conditions that arise in the use of waterwheels in the service. Previous articles showed methods of calculating tidal power. An outline of the physiographic, engineering, commercial, industrial and economic problems which must be investigated in connection with tidal power is given. It is said that a good case may be made out for such a development in the Severn estuary.—London *Engineer*, Dec. 17, 1920.

Voltage Regulation on Long Alternating-Current Lines.—THIELEMANS.—The author takes as his starting point the old theorem saying that any condition of loading in an electric system may be formed by superposing the corresponding no-load and short-circuit conditions. The equation system of a transmission line then is formed, and a tripolar diagram is derived, which permits a rapid determination of voltages and currents for any given load and power factor of load. The diagram is used for a study of voltage regulation by means of synchronous condensers. A special "compensated voltmeter" is used in another system of voltage regulation. This voltmeter is installed at the generating station, but indicates the voltage at some point down the line—for instance, at the receiving station—and by means of a voltage regulator controls the generator excitation so as to maintain a constant received voltage. The compensated voltmeter, in order to give the desired indication, is connected so that it measures the vector sum of sending-end voltage plus the drop across a certain impedance through which flows a current proportional to the sending-end current. It is easy to show, by means of the system equations, how the voltmeter should be calibrated in order to show received voltage and what value the compensating impedance should have. The best regulating system seems to be one where an undercompensated voltmeter, controlling the generator excitation, is combined with a constant-voltage synchronous-condenser regulator at the receiving end. The effect upon voltage regulation of the terminal transformers is discussed. The article includes some rather complete three-phase voltage regulation diagrams, which refer to lines of 450, 500, 1,000 and 1,500 km. length at 50 cycles.—*Revue Générale de l'Electricité*, Sept. 25, Oct. 2, 9 and 16, 1920.

Preservative Treatment of Wood Poles—R. V. ACHATZ.—A survey of the State of Indiana was made and showed that a considerable proportion of the poles erected at the present time are receiving some kind of treatment. The most commonly used preservatives are derivatives of coal tar. Dead oil of coal tar or creosote oil and the higher boiling oils known as carbolineums are the most satisfactory preservatives. The commonly used treatments in Indiana are the brush treatment and the open-tank treatments, either by dipping or by the hot and cold process. A study of the economic side of pole preservation shows that under average conditions an increase in life of about two years will justify brush treatment, about three and one-half years will justify the open-tank dipping treatment in hot creosote, and about seven and one-half years the hot-and-cold-bath open-tank treatment. It is also said to be possible to increase the life of poles already in service to some extent by reinforcement and treatment after setting. Specifications adopted by various bodies for the purchase of preservatives and specifications for the application of the treatments recommended are included in the appendices of the paper.—*Circular No. 2, Engineering Experiment Station, Purdue University*, June, 1920.

Hydro-Electric Power in Norway.—W. E. WILLIAMS.—The latest available data, as summarized in this article, indicate that the total available power of southern Norway is 9,531,000 hp., of which 1,250,000 hp. is already utilized or in course of development. Water-power sites are said to be economically available if the cost of production does not exceed £25 per horsepower (pre-war conditions) and the horsepower is greater than 1,000. The location of the principal falls already developed at least in part and data concerning them are given in the following table:

Name of Station	Fall in Feet	Hp. Available	Hp. Developed	Use to Which Power Is Put
Rjukan I	930	136,000	135,000	Nitrate production
Rjukan II	830	122,000	122,000	Nitrate production
Tysse (Odda)	1,260	150,000	125,000	Carbide, cyanamide, etc.
Glommen Falls:				
Morkfos	66	70,000	44,000	
Kykpelsmo	62	66,000	42,000	
Vamma	87	93,000	58,000	Nitrate and general supply
Sarpsfos	66	70,000	44,000	Cellulose factories and carbide
Notodden (three falls)	305	72,000	60,000	Nitrate and carbide
Boilesfos (Arendal)	200	31,200	31,200	
Bielvo (Aalvik)	2,900	43,000	43,000	Town supply and carbide
Samnanger	....	30,000	30,000	Town supply
Vigelanfos	59	14,400	14,400	Aluminum
In course of development:				
Mattre	....	96,000	74,000	
Tyin (Aardal)	3,500	80,000	80,000	
Austdola	....	43,000	43,000	
Lilledal	2,600	91,700	91,700	
Aura	2,600	156 000	142,000	

Further details of the principal installations shown in the table are given in the original article.—*Beama*, November, 1920.

The Distribution of Electricity.—W. B. WOODHOUSE.—Dealing with the distribution of electrical energy in broad measure the author's conclusions may be summarized as follows: (1) Three or more pressure systems are necessary for economy (a) for detail distribution, (b) for power purposes, and (c) for transmission or tie-line purposes. (2) The detail distribution pressure is fixed at a single-phase pressure of from 200 volts to 250 volts. (3) The size of the distributing substations is determined by the density of load and the size of power users' installations. (4) The distance between these substations depends primarily on the distribution pressure. (5) The main distribution pressure is determined by the number of substations in the area, the total load and the economical balance between expenditure on mains and substations. In industrial areas a pressure of 10,000 volts appears economical. (6) The extent of each power distribution network may be reduced with economy as the load develops and the size of substations increases. (7) The transmission pressure is primarily determined by a consideration of pressure drop and total power. No advantage is gained by exceeding a minimum fixed to meet demands anticipated to arise in a period determined by the rate of growth of load. (8) Main substations are determined in number by the load on the power distribution networks, the pressure distribution and the number of generating stations.—London *Electrician*, Dec. 3, 1920.

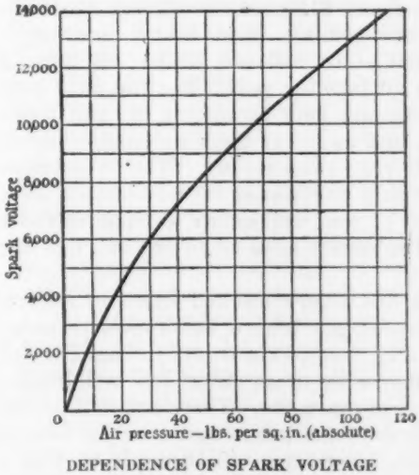
Traction

Advantages of Automatic Railway Substations.—CHARLES H. JONES.—The advantages of automatic over manually operated substations, according to experience on the North Shore & Milwaukee Railroad, are as follows: (1) Reduction in cost of substation operating labor; (2) reduction in power loss due to elimination of idle running time; (3) reduction in the size and length of feeders due to the increase in number of substations; (4) the alleviation of the electrolysis trouble in cities; (5) a substantial saving in substation building costs, and (6) increase in load factor on various machines.—*Electric Railway Journal*, Jan. 22, 1921.

Snow-Fighting Methods.—E. SEARS.—Snows of moderate depth—4 ft. to 5 ft. (1.2 m. to 1.5 m.) can easily be cleared by the wedge-type snowplow, but for deeper snows rotary plows are necessary. The performance of the electric locomotive is much more satisfactory than the steam locomotive, for the reason that it does not freeze.—*Electrical Journal*, January, 1921.

Installations, Systems and Appliances

Effect of Shunted Resistance, or Plug Leakage, on Sparking Performance of Electrical Ignition System.—G. E. BAIRSTO.—A series of tests were made to determine the effect of shunted resistance on the spark voltage of most of the leading types of electrical ignition systems. One of the limitations imposed on an electrical ignition system by the engine is that after a spark plug has run for some time it becomes a fairly good electrical conductor, owing to deposits of carbonized oil on the surface. Although the relation between the spark voltage and air pressure is not quite the same for all types of ignition systems and various magnitudes of leak, the curve shows a means for various systems and leaks, giving a typical relation.—London *Electrician*, Dec. 10, 1920.



DEPENDENCE OF SPARK VOLTAGE ON AIR PRESSURE

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

N. E. L. A. Convention to Be Held in Chicago, May 31 to June 3

ANNOUNCEMENT was made this week that the forty-fourth annual convention of the National Electric Light Association will be held in Chicago at the new Drake Hotel, May 31 to June 3, inclusive. While Hot Springs, Ark., had frequently been mentioned in connection with this year's convention, it was believed by President Martin J. Insull and the executive committee that because of the conditions attendant upon the reconstruction period it would be absolutely essential this year to hold the convention in a central place easily accessible from all parts of the country, and that geographically and from the point of view of transportation Chicago was the logical meeting place.

The Drake Hotel is at Lake Shore Drive and North Michigan Avenue, formerly called Lincoln Parkway. It is reputed to be the most modern hotel in the United States in every particular, and the N. E. L. A. convention will be the first to be held in the hotel following its completion. Further details of the convention plans will be announced later. It is expected that many important reports and papers will be presented, and men of national prominence will deliver addresses at the general sessions.

Favorable Money Rates to Rule for Well-Known Companies

THE flood of new financing has been loosed and millions in new securities are coming on the market. Other millions are scheduled. During the current week the investors had about $150,000,000 offered to them. These securities are coming from every direction—industrial, municipal, state, railroad, utility, oil, mining and foreign issues all forming part. For the most part the securities offered are long term. Six, 6½ and 7 per cents predominate, and issues of large nationally known properties are sold very close to par. The investment demand is still strong for issues of well-known companies. For issues of less well-known companies there is no demand, and salesmen have to go out and find the investor.

Such a situation has a very marked effect on electric light and power financing. Where well-known corporations pay a margin of four to six points to bankers and underwriters for disposing of an issue, less well-known companies will have to pay more. There are indications that, although the money market is easier in some ways, only the well-known companies will be able to obtain substantial reductions in the price of money. There is more money available for investment than there has been for two or three years, but there is more competition for that money.

Utilities without a national reputation and known only locally will undoubtedly find the best results this year in local financing. The large financial interests are not attracted by any except the best-known names, and there are reasons to believe that they will not engage in promoting little-known companies except at a margin of profit that is prohibitive.

New York to Test Water-Power Act in Courts

AUTHORITY to test the constitutionality of the Federal water-power act before the courts was given to the Attorney-General of New York State by the State Legislature in a resolution passed on Monday. Action will be brought to restrain the Federal Power Commission from exerting authority over power rights on New York boundary streams. This authority the state claims as its own.

New York State Will Require 3,500,000 Additional Hp. by 1930

A CONSERVATIVE estimate shows that the State of New York and the metropolitan district, which includes districts in New Jersey, will require an additional 3,500,000 hp. by 1930, according to a statement made by W. B. Parsons in his paper on "Heat, Light and Power for the Metropolitan District of New York," read before the American Society of Civil Engineers at New York on Wednesday evening of this week. The undeveloped water-power resources of the state practically available cannot be placed at more than 1,500,000 hp., so it is obvious that much of the power development that can be expected in the near future will be of the steam-electric type.

The problem of power development thus comes down to the utilization of the water-power resources to the fullest extent possible, Mr. Parsons said, and the transmission of such energy to the market centers of the state, including the metropolitan district.

The serious and widely extended differences in frequency constitute a big obstacle to serving a number of systems from a transmission line running through the state from the various developable water powers. There is now an installed horsepower of 700,000 at 60 cycles, 150,000 at 40 cycles and 1,950,000 at 25 cycles in the State of New York. In New York City 280,000 hp. is installed at 60 cycles, while the 25-cycle installations amount to 1,450,000 hp. In that portion of New Jersey included within the metropolitan area there is 250,000 hp. installed using 60-cycle current and 60,000 hp. using 25-cycle current.

It is on the metropolitan district that the burden of furnishing new installations will fall. Of the estimated 6,700,000 installed horsepower that should be in existence in 1931, 4,500,000 hp. will be found within a distance of 30 miles from the center of this district. The

hydro-electric transmission lines to the metropolitan district, varying in length from 100 miles, as would be the case from the Delaware River, to 250 miles from the Adirondack and more than 350 miles from the St. Lawrence and Niagara, present to the manager in the metropolitan district worries as well as advantages.

Great as are the potential water-power resources of New York, two things are obvious: (1) The amount is not in excess of actual requirements; (2) the objections to long-distance transmission will prevent the bringing of the whole of the supply to the metropolitan district from northern points. Here the demands for service are more exacting than in any other part of the state, and interruptions of service cannot be tolerated. To this end the distributing companies have assumed the burden of placing all their transmission lines underground.

Mr. Parsons pointed out that the water-power resources of New York could be developed along four different lines—first, the development of additional power at Niagara Falls; secondly, the St. Lawrence River development; third, the Delaware River, and, fourth, the streams lying wholly within the state.

Water Power Possibilities

The Niagara River has substantially 5,000,000 hp., which could be developed, but public sentiment would not permit this expensive utilization. The St. Lawrence River offers 500,000 hp. or 600,000 hp. along the New York boundary, or taking the whole river between Lake Ontario and Montreal perhaps 5,000,000 hp. Of the Niagara's power one-half would belong to Canada, and of the St. Lawrence power a certain amount, as will be fixed by international negotiations. The Delaware River probably would develop about 350,000 hp., of which 200,000 hp. might be secured by the State of New York. However, the State Conservation Commission claims but 40,000 hp. as being capable of development within the boundaries of New York State. In the streams lying wholly within the state there is a possible development of 1,000,000 hp.

Among the persons who discussed Colonel Parsons' paper were Farley Osgood, vice-president of the Public Service Electric Company of New Jersey; John W. Lieb, vice-president of the New York Edison Company; F. W. Smith, vice-president of the United Electric Light & Power Company; George Otis Smith, director U. S. Geological Survey. and W. S. Murray of the Super-Power Survey.

While Mr. Lieb classified the paper as an admirable survey, he expressed a doubt whether interconnection of electric systems in the Northeast Atlantic States will ever raise the load factor of the larger power plants appreciably, since the diversity factor of interconnected systems cannot be much greater than that of a large constituent like New York unless the load characteristics are entirely different. To assure reliable service Mr. Lieb contended that battery standby will always be necessary in New York and that any trunk line transmission should be of the most reliable double-circuit construction. Economies can be effected through interconnecting isolated plants and central stations, but several practical obstacles stand in the way. One of the best ways to increase load factor and hence economy, he said, is to develop battery charging loads.

F. W. Smith discussed the practicability of water power utilization in New York State and the possibilities of financing, referring particularly to objectionable features of water power regulations.

Federal Power Commission Appropriations

THE Senate has added the following amendment to the Federal Power Commission's item in the sundry civil bill: "For executive secretary, $5,000; chief clerk, $3,000; chief accountant, $3,000; accountant, $2,500; two assistant attorneys, at $2,500 each; clerks—one $1,400, one $1,200; civil engineers—one $2,400, one $2,100; hydraulic engineer, $2,400; electrical engineer, $2,400; mechanical engineer, $2,400; draftsmen—one $2,000, one $1,500; in all, $36,300."

The appropriation approved by the House of Representatives was in turn reduced to $80,000.

Southern California Edison Company Increases Dividends

AN EXTRA dividend of $1 per share of common stock in addition to the usual quarterly dividend of $1.75 has been declared by the Southern California Edison Company. This brings the common-stock rate up to 8 per cent and also will automatically cause the preferred-stock dividend rates to be increased to 8 per cent, as preferred stock participates with the common above 5 per cent.

This extra dividend, it is stated, is in a way a step toward the new "reward for efficiency" policy of the company, which has pending before the California Railroad Commission an application for authority to divide between the stockholders, the consumers and the employees those earnings which are due to increased efficiency in design and operation. In the month of January an order was handed down by the commission reducing the surcharges collected by the company from 27 per cent to 20 per cent, thereby granting the consumers a share in the results of greater economy.

Sees Solution of Trucking Problem in Use of Electric Vehicle

TRUCKING problems in the metropolitan district of New York and the part which the electric vehicle will play in their solution were discussed at the three hundred and eighty-ninth meeting of the New York Electrical Society on Wednesday evening, Feb. 9. William H. Onken, Jr., editor of the ELECTRICAL WORLD, speaking for James H. McGraw, president of the McGraw-Hill Company, on "The Electric Vehicle for City Delivery," brought out the fact that much time and money could be saved in handling freight at steamship piers and railroad terminals by the use of electric trucks. Deliveries of coal on short hauls can be made by these trucks at a cost approximately 60 per cent less than that of gasoline-driven trucks. The same saving holds true of the average of all other city deliveries.

The field for the electric truck has scarcely been touched, declared Arthur Williams, in discussing the "Electrotechnical Aspect of City Trucking." The amount of money paid out in the United States for secondary transportation, to which the electric truck is particularly adapted, he stated is sixteen times that of the country's total freight bill. Use of the electric truck to speed up the handling of commodities in congested city terminals and streets would effect an enormous saving.

J. J. Riordan, president of the United States Trucking Corporation, in describing the "Trucking Problem of New York," said electric industrial and commercial trucks would be the means of relieving traffic congestion.

Edison Pioneers Hold Annual Gathering at Inventor's Home

BY INVITATION of Mrs. Thomas Alva Edison the Edison Pioneers met yesterday in celebration of Edison's seventy-fourth birthday at "Glenmont," Llewellyn Park, West Orange, N. J., the inventor's home. This gathering took the place of the annual luncheon of the organization. A meeting took place, immediately after the arrival of the members, in a room placed at their disposal by Mrs. Edison, who served a buffet luncheon to them and the members of their families who accompanied them. A reception and special exercises followed. William J. Hammer is the president of the Edison Pioneers and T. Commerford Martin was chairman of the reception committee.

Kansas Would Separate Utility Regulation from Industrial Court

GOVERNOR ALLEN has recommended in a special message to the Kansas Legislature this week taking public utilities from the jurisdiction of the Court of Industrial Relations and creating a new utilities commission. A bill to that effect has been introduced into the Kansas Legislature. It contains a provision that in utility matters where labor is interested the judges of both courts shall sit. The effect of this provision, is is said, would be that in most of the really important utility cases the two courts would join, but the industrial court would be relieved of considering a multitude of small utility matters.

To Take Power of Removal of Utility Board from New Jersey Governor

THE New Jersey State Senate has passed a bill creating a state public utility commission of three members in place of the board of five members now authorized and extending the term of the commissioners to six years, with annual salary increased to $12,000 a year for each commissioner. The bill eliminates the feature of the existing law giving the Governor the power of removal for neglect of duty or misconduct and substitutes therefor trial by impeachment. The new measure has been sent to the House, where it seems likely of early passage. The proposed law is an aftermath of the controversy, still pending, between Governor Edwards and the present utility board, which officially has been removed from office, but pending decision by the Court of Appeals continues to function.

West Virginia Commission Being Officially Investigated

BILLS have been introduced into the West Virginia Legislature to abolish the Public Service Commission of the state. These bills have grown out of public dissatisfaction with increases allowed public utilities, especially the gas companies. No action has been taken on any of these bills, but on the insistence of the commission that its official acts be reviewed a committee has been named by the Legislature to inquire into the manner in which the commission has discharged its duties.

In addition to the bill to abolish the Public Service Commission measures have been introduced providing for the transfer of its activities to other bodies already in existence. However, it is regarded as being extremely doubtful whether favorable action will be taken upon any of these bills in the form in which they are introduced.

Indiana Engineers Support Utility Commission

THE abolition of the Indiana Public Service Commission and the re-establishment of the utility service rates in effect in 1913, as proposed in House Bill No. 75 in the Indiana Legislature, would be an act of economic retrogression which would entail loss and inconvenience to the people of the state and would throw a great many of the public utility companies into bankruptcy, was the sense of resolutions opposing the bill and passed by the Indianapolis-La Fayette Section of the American Institute of Electrical Engineers, the Indianapolis Chapter of the American Society of Mechanical Engineers and by the Indiana Engineering Society during the course of the forty-first annual convention of the Indiana Engineering Society in Indianapolis a short time ago.

California Commission Investigation Aims to Restore Public Confidence

EMPHATIC declaration has been given by State Senator John M. Inman, chairman of the legislative committee that is investigating the workings of the California Railroad Commission, that there exists no thought of attack on the integrity of the commission. It is the purpose of the committee, Mr. Inman said, to get the commission and the people into closer contact and "to bring to the people the confidence in this great body which it once had."

The occasion for this assurance was a hearing in San Francisco at which John J. Daily, assistant city attorney, asserted that the abolition of the commission would be a calamity and "the biggest crime ever attempted in the State."

Governor Small Appoints New Utility Commission for Illinois

SUSPENSE concerning the Illinois Public Utilities Commission situation was relieved by the announcement on Thursday of last week that Governor Small had appointed a new commission. The appointments are as follows: Chairman, Frank L. Smith, Dwight, Ill., retiring Congressman from the Bloomington district; Cicero J. Lindley, Greenville, a member of the Railroad and Warehouse Commission during the Tanner administration; Patrick H. Moynihan, South Chicago; Hal W. Trovillion, Herrin, and James F. Sullivan, Chicago. The old members of the commission still remaining will retire. It is rumored that there is considerable question whether Mr. Smith will accept the appointment.

United Engineering Society Elect Officers

AT THE annual meeting of the board of trustees of the United Engineering Society Jan. 27 the following officers were elected for the ensuing year: President, J. Vipond Davies; first vice-president, Calvert Townley; second vice-president, W. L. Saunders; secretary, Alfred D. Flinn; treasurer, Joseph Struthers; assistant treasurer, George H. Pegram.

European Market Will Grow with Power Development, Says F. L. Driver

DEVELOPMENT of the European market for electrical merchandise, including labor-saving devices, must naturally follow the greater extension of electric service, especially that derived from natural resources, according to Frank L. Driver, president of the Driver-Harris Company. Mr. Driver spent four months in Europe last spring, and upon his return to this country on Jan. 20 after spending a further period of two months abroad in the direction of his company's two manufacturing subsidiaries, one in England and the other in France, he was asked by the ELECTRICAL WORLD to outline his impressions of the fundamental economic conditions of Europe with especial reference to the socket-device market.

"Demand for labor-saving devices in Europe is growing," said Mr. Driver, "but not so fast as in the United States. There is not the variety of devices there that exists here, nor is there so much duplication of lines. The greatest use will undoubtedly come from those countries having abundant natural power resources, such as Switzerland and Italy. In England, where the average home does not now have electric service, development of the socket-device market must be slow, but it will follow the greater use of electricity which will come as the nation's power facilities are increased.

DEMAND FOR POPULAR-PRICED DEVICES

"European requirements call for a sturdy utility device to sell at a popular price to compete with similar lines made locally in a rather crude fashion. Trimmings, which add an element of price, are looked upon in Europe as luxuries. Furthermore, the average European, because of taxes and other onerous living conditions, has become more thrifty than ever before."

English labor, Mr. Driver pointed out, was engulfed in a wave of extravagant spending during the war and for a time afterward. Wages were decidedly greater, and the working classes simply "blew in" their money on luxuries that they had never been able to enjoy before the war. This desire for luxuries, however, Mr. Driver said, was not translated to any considerable degree into a greater use of electric service in the home. In France, according to Mr. Driver, the people are more thrifty and the spending wave was not so apparent.

In general Mr. Driver is inclined to take an optimistic view of the business situation both in England and France. He said that in his conversations with business men in those countries the opinion was freely expressed that changed conditions had to come sooner or later, and the general impression which he gathered was that the bottom of the depression had been reached.

"While I am confident that the European situation will work out favorably," Mr. Driver declared, "some steps must be taken by American financial interests to encourage it. Europe wants and needs our money. It wants us to establish business there and welcomes us with open arms. However, it must have extended credits, and we must find some methods for granting them. You can't ask individual firms to do it because of their inability to carry such a load singly. Nevertheless, there must be some credit link.

"If Europe can only secure raw materials, there are sufficient factory accommodations to work it up. The spirit of labor to work is splendid, only of course it must be directed. In England especially, where for a while the working class was on the brink of revolt, labor is now very steady. Wages are higher than before the war and in general in England and France are about half what they are in the United States."

When asked how the Russian situation was viewed abroad, Mr. Driver said that the impression he gained was that affairs would be allowed to drift until they found their level. There was no evidence, he added, of any desire on the part of European nations to trade with Russia, though perhaps Germany should be excepted.

Mr. Driver has been a student of European economic conditions and methods of doing business for a number of years. Back in 1910 his company, then the Driver-Harris Wire Company, established an agency in England and shipped goods over on order. This procedure was found to entail too much delay, and to obviate this goods were shipped on consignment, a practice which was followed until 1917, when the business had reached $300,000 or $400,000 annually. Then the next step of establishing an English manufacturing company followed, and, according to Mr. Driver, the results have fully justified the step. Raw materials are now sent from the United States to this factory for fabrication there. The English company, known as Driver, Drennan & Cooper, Ltd., now does all the melting to make castings and produces a line of nickel-chromium alloys in wire and sheet. The English company finds a market for resistance wire, cable, flat strip, pure nickel, copper-nickel alloys and castings not only in England but also in Italy, Switzerland, the Scandinavian countries, Spain and France.

FRANK L. DRIVER

Electricians' Strike Follows Wage Reduction

REDUCTION in wages of cable splicers from $8 to $7 per day, of linemen from $7 to $6 per day and of operators from $200 to $175 per month by the Great Western Power Company of California has been followed by a strike. The company says that less than half of its men have left, that its service has not been impaired and that new men are rapidly filling the places vacated.

The company claims that the increase of $1 per day granted last year was to compensate for increased living costs, which have now materially decreased. The company further states that the last increase put its wage rate above those generally in effect on neighboring systems. The strikers assert that last year the company received an increase in rates to compensate for the increases in wages, but that with this decrease in wages there has been no corresponding decrease in rates.

Senate Votes for Continuance of Muscle Shoals Work

THOSE who favor a continuance of the development work being done by the Government at Muscle Shoals on the Tennessee River are much encouraged by the action of the Senate Feb. 5, in the face of strong opposition, in upholding the committee on appropriations, which had inserted in the sundry civil bill an appropriation of $10,000,000 for the Wilson Dam. The committee on appropriations of the House declined to include the item in the bill, and an effort made on the floor to embody it failed by a small margin. There is some doubt whether the item can be retained in conference.

Senator Underwood stated that since expenditures are continuing each day there is every prospect that the full $17,000,000 at the disposal of the engineers will have been expended or obligated before any action is taken to discontinue the work. If Congress refuses to carry on the existing work, he declared, the next big rise of water in the Tennessee River will wash the Government's $17,000,000 down stream.

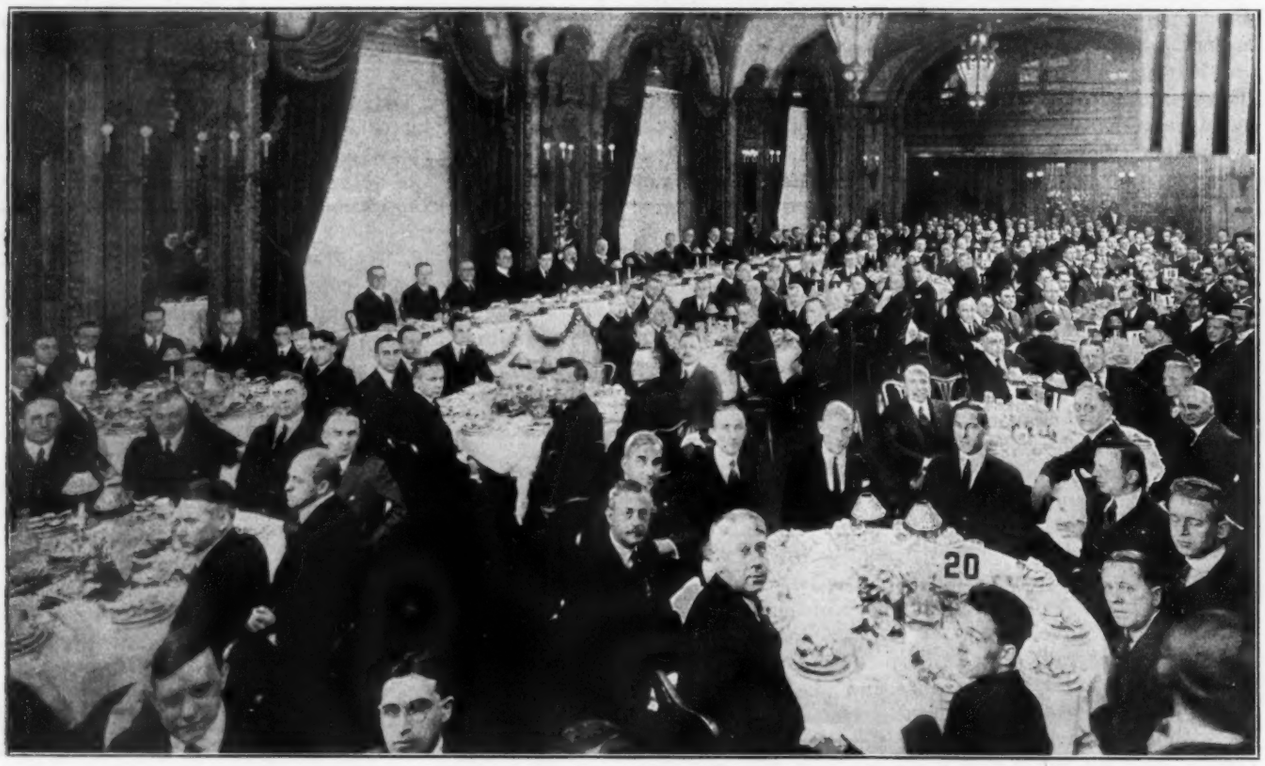
Senator Lenroot of Wisconsin, one of the most active opponents of any development at Muscle Shoals, predicted that neither the dam nor the nitrate plant will ever be used for the making of fertilizer. The Government, he said, will expend its $50,000,000 on this dam and "then we will have one customer, the Alabama Power Company, a corporation organized in Montreal and British-owned." When the dam is completed, Senator Lenroot asserted, he expects the Alabama Power Company to offer the Government $10 per horsepower-year, which it will resell for $20. The Government either would have to accept that proposition or expend an additional $29,000,000 for a distribution system. He thought that the Government would accept the Alabama Power Company's offer.

Conferees Approve Provision for Higher Patent Office Salaries

CONFEREES of the Senate and the House have approved the Patent Office bill providing for the higher scale of salaries authorized by the House and including the provision that the Federal Trade Commission administer patents taken out by government employees. Opposition to the adoption of the conference report is anticipated because of this latter provision. It is fully expected, however, that the bill will become a law as approved by the conferees.

The increase in the salary scale at the Patent Office was regarded as an urgent necessity. The efficiency of the whole service is menaced because properly qualified examiners cannot be attracted by the present scale of salaries. At present out of the ninety-four examiners employed in the Patent Office fifty-six are temporary employees because the Civil Service Commission cannot obtain an eligible list.

Enthusiastic Electric Vehicle Luncheon



WHAT was probably the largest single gathering ever held to sing the praises of electric transportation occurred on Feb. 2 when between two and three hundred sat down to luncheon at the Hotel Astor in New York to celebrate the first electric vehicle show, then in its first week. Speeches as reported in last week's ELECTRICAL WORLD on page 333 were made by former Governor Alfred E. Smith, now president of New York City's largest trucking company; William H. Onken, Jr., editor of ELECTRICAL WORLD, who spoke for James H. McGraw, president of the McGraw-Hill Company; Robert E. M. Cowie, vice-president of the American Railway Express Company, and Arthur Williams, general commercial manager of the New York Edison Company and under whose guidance the show is being conducted.

Hortonia Company Quickly Rebuilding Damaged Station

RECONSTRUCTION of the Otter Creek hydro-electric station of the Hortonia Power Company at Middlebury, Vt., is proceeding rapidly after its recent serious damage by fire, according to advices from I. M. Frost of Rutland, Vt., vice-president of the company. The station structure, switchboard and coils of generating and exciter equipment were destroyed on Jan. 15 at 9 a.m. In the afternoon clearing of the ruins was begun, orders were placed by telephone with the General Electric Company for a new switchboard, and repair men were promptly mobilized to remove the damaged coils. The station structure was scheduled for completion in the first week of February, and it is hoped to have at least one of the three units in operation turning out 1,000 kw. by Feb. 20.

Martin Insull Voices Necessity of Publicity

PUBLIC utility business ceases to become a natural monopoly when those in charge of the operating companies go into the markets of the world for money, President Martin Insull of the National Electric Light Association declared before the New England Geographic Division at Boston on Jan. 26, when he emphasized the vital importance of publicity in making the problems and the service attainments and possibilities of the electric light and power industry clear to the people. The speaker emphasized the importance of bringing home to local publics the high percentage of good service rendered them. He declared that good service cannot go ahead of increased rates. Service and reasonable rates go together, but without reasonable rates good service cannot be kept up.

The publicity campaign of the national association, the speaker said, should be supplemented by the spoken word of the central-station man in the communities which he serves. As a general proposition the American people judge fairly when all the facts are given to them. "Let us give them the facts and not permit them to be dependent upon the information handed them by demagogues," said Mr. Insull. The speaker briefly outlined the immense importance of public utility service from the social and industrial standpoint, picturing the disasters which would be entailed by its cessation. Things like this, he said, should be brought home to the public in all parts of the country, and the magnitude of the investment required to serve the public should be made clearer. A single strike by the operators of a small independent telephone company near Chicago caused five deaths and one disastrous fire, Mr. Insull said, in illustrating the point.

All that can be obtained under regulation, he continued, is a fair return upon the investment. Regulation by competition is economic waste. Mr. Insull said that he was a strong believer in regulation, but that the industry needs a flexible regulation which can change rates as conditions require.

During his address President Insull touched upon the value of interconnection, stating it has not made any great profit for the investor, but has given the small community the same facilities as are available in the city. Interconnection has literally made two blades of grass grow where one grew before. Only 60 miles of transmission line remain to be built in order to tie together St. Paul, Chicago and Indiana companies. Only a 30-mile gap remains between Indianapolis and Louisville via the Keokuk transmission line.

Worcester Company Reduces Rates

ONE cent per kilowatt-hour will be taken off the residential lighting, heating and cooking rates of the Worcester (Mass.) Electric Light Company on bills rendered on and after March 1. These rates, declared F. H. Smith, assistant general manager, are to be put into effect in spite of the fact that the company has a six months' supply of coal on hand purchased at higher costs than the present market demands. The maximum rate will drop from 9 cents to 8 cents per kilowatt-hour under the new schedule, or only ½ cent above the rate in vogue last fall, from which the advance to 9 cents took place. Notwithstanding the business recession, the diversity of loads carried by the company has enabled its earnings to be well kept up, and only a moderate falling off in energy output has been experienced.

"Coal Clause" Disapproved by Michigan Commission

GROWING disfavor on the part of public service commissions for rate schedules that go up and down in ratio with the varying price of coal was exemplified at Hancock, Mich., a week or two ago, when the Michigan Public Utilities Commission barred out the "coal clause" contained in the rates of the Houghton County Electric Light Company, a Stone & Webster Company. In announcing the attitude of the commission in this regard Chairman Sherman T. Handy said:

"We believe that the coal-clause charge is not a good thing for the company. We do not believe it is a good thing for the community. I do not care how honest a company may be—so long as it is left in its power to fix the rates by the so-called coal-clause charge there is bound to be some criticism and some charges of dishonesty. No public utility can afford a situation of that kind. A public utility to be completely successful must in addition to having a complete plant have the complete confidence of the community. That is the only asset it has. We regret that there is any feeling in Houghton County between the company and the users. We believe that anything which will tend to restore the confidence of the public in the utility would be a good thing. We believe that this coal clause should not be further considered; that we should direct our attention from now on to what will be a proper rate, eliminating the coal clause charge."

Detroit Edison Will Offer Stock to Local Investors

COMMON stock amounting to 20 per cent of the total stock of the company outstanding is soon to be offered to local investors by the Detroit Edison Company, according to the annual report for 1920, made by President Alex Dow, who says that the present stockholders of the company have responded satisfactorily to the company's recent invitation to waive their rights of subscription to the proposed new issue. At the end of 1920, more than half of the company's outstanding stock was held by residents of Michigan.

Wisconsin Metermen's School a Success

FROM Jan. 31 to Feb. 4 an electrical metermen's school was held at the electrical engineering laboratories of the University of Wisconsin under the auspices of the university extension division and the College of Engineering with the co-operation of the Wisconsin Railroad Commission and the Wisconsin Electrical Association. Eighty-one men, representing more than fifty utilities of the state, were registered for the course. The manufacturers of watt-hour meters each had one or more men present who assisted both by lectures and by personal instruction.

Those taking the course received instruction in specific problems of installing, testing and the maintenance of the different kinds and types of meters both with and without transformers. The lectures covered such subjects as electrical units and measurements, principles of watt-hour meters, meter constants, meter adjustments and instrument transformers. In the laboratories the men installed, tested and adjusted the meters according to specific directions. The course was so successful that most of the men expressed a desire to have it repeated next year.

Federal Reserve Board Sees Turn for the Better in General Business

IN ANALYZING the reports of its member banks on general business conditions during the month of January, the Federal Reserve Board makes the following statement:

"The business developments during the month of January have shown a slight but unmistakable turn toward a better state of affairs. At some plants where considerable numbers of men have been unemployed industrial operations have been resumed in whole or in part. The Bureau of Labor, however, reports a total of 3,473,466 unemployed for the country as a whole. Prices in many lines have gone no lower than the level which had been established at the close of 1920. Banking conditions have materially improved, partly through the steadier and more rapid movement of agricultural products to market and partly through the more rapid liquidation of paper already held by member banks. As a result the reserve ratio of the Federal Reserve System has risen to 49 per cent at the last reporting date in the month (Jan. 28). Member bank conditions also show improvement in liquidity and increasing strength. Failures have been relatively fewer. There are signs of a distinct improvement in certain branches of the textile trades, while retailers are now beginning to buy much more freely and actively than heretofore owing to the depletion of the stocks on their shelves. Transportation supply has been fairly equalized with demand, and there is now little or no delay of goods going from producer to consumer. Farm products, although fluctuating more or less widely, have maintained themselves at prices substantially equivalent to those established during December. There has been little or no gain in export trade conditions, but preparations for the placing of export financing upon more satisfactory basis were believed to lay the foundation for a distinct improvement of the outlook. Retail prices have shown during the month of January a much greater tendency to reflect the changes that had already occurred in wholesale prices. While, therefore, it cannot be said that very material alteration of fundamental conditions has occurred, enough progress has been made to give assurance of a steady movement toward sounder conditions in business."

Oklahoma Gas & Electric Retires Underlying Securities

FOR the purpose of retiring underlying bonds and notes and the payment of floating debt incurred for extensions and additions to its property the Oklahoma Gas & Electric Company offered this week a six-million-dollar issue of twenty-year first and refunding mortgage 7.5 per cent gold bonds at a price to yield the investor about 8 per cent. This issue, together with the issue of $2,500,000 bond-secured 8 per cent convertible gold notes reported in the ELECTRICAL WORLD last week, will provide funds for wiping out the closed mortgages of all underlying properties.

Permanent Financing Plan Proposed for San Joaquin Company

BECAUSE of the large increase of business and the increased activity in construction work undertaken by the San Joaquin Light & Power Corporation, Fresno, Cal., in the past few years, the company is contemplating increasing its capitalization from $25,000,000 to $150,000,000. It is proposed to increase the total authorized stock issue, divided into three classes of stock which are now authorized and outstanding, without any change in the characteristics of any class of the stock. Provision will also be made for the issuance of bonds. It is believed by the officials of the company that these plans will provide a financial structure sufficiently flexible to meet the varying money-market conditions. While the increased capitalization is being authorized at this time, the additional stocks and bonds will not be issued until the money is actually needed to pay for new work done and only as earnings justify their issuance.

Detroit Edison's 1920 Earnings Did Not Keep Pace with Demand

GROSS revenue of $21,990,351, expenses totaling $17,456,658 and net income, after paying interest on funded and unfunded debt, of $2,070,936 are shown by the annual report of President Alex Dow to the stockholders of the Detroit Edison Company for 1920, which has just been issued. In each case the figures are approximately $5,500,000 above the corresponding ones for 1919. Well over a billion kilowatt-hours was generated in 1920, an increase of nearly 15 per cent. Although the demand reached a maximum, earnings did not increase in proportion. This was due to three causes—operating during different periods—the railroad strike of April, which interfered with the company's coal supply and forced a suspension of service for a week or two to "non-essential" industries; the slow delivery of equipment ordered in good time, which forced a curtailment of output from May to October, and the industrial depressions which caused a slump in demand in November and December, just after a third new turbine had afforded the much-needed increase in generating equipment.

The operating ratio was the highest in the history of the company, being 77.6 per cent. In 1919 the figure was 68.9. It was 67.2 per cent in 1918, 63.8

in 1917 and 54.5 in 1916. The causes, the report says, are obvious—wage rates above the high figure of 1919, no opportunity until late in the year to make the replacements needed to improve production efficiency, the several periods of reduced output recited, but, far above all other causes, the excessive prices charged for coal and the poor quality of the coal purchased at excessive prices.

The company is still paying the highest wages it has ever paid, and no horizontal reduction is expedient or possible, though wages in certain classes will be lower. The rate schedule as it stands is proportionate to the prices for coal which the company expects to prevail in 1921.

For the first time in the history of the company the profit and loss account shows a reduction of surplus, which now stands at $1,653,687, as compared with $2,659,758 a year ago.

Mr. Dow concludes with an expression of optimism as regards 1921, based on the disappearance of the company's mechanical difficulties, the rate increases accorded to it and its sound foundation of general and permanent public service.

Hearings on Calder Coal Bill to Be Continued

HEARINGS on the Calder coal regulation bill continued much longer than was contemplated originally. The complexity of the problem was so impressed on the committee that the plan to limit the hearings to three days was abandoned. At this writing it seems very probable that the bill will be reported favorably to the Senate within the next few days. It is admitted, however, that it will be amended in important particulars.

With the extension of the hearings the possibility of passing the legislation at this session of Congress has grown materially less. The bill is certain to provoke extended discussion.

No Serious Objections to Tyler Report on Great Falls Development

LITTLE opposition to the Tyler report on Great Falls developed at the hearing conducted by the Federal Power Commission Feb. 1. The fact that the important interests concerned interposed no objections and showed no tendency to challenge any phase of the report is regarded as significant. Another important development at the hearing was the emphasis given to the advisability of treating the water-supply problem of the District of Columbia as a separate project.

The Secretary of War, in opening the hearing, made a plea for the early development of the power at Great Falls as well as at every other available site in the country. He expressed the opinion that the demand for power in the District of Columbia and the adjacent areas of Virginia and Maryland is so great that there is no likelihood of putting a large steam plant in Washington out of business.

J. H. Leavering, an independent engineer, representing no special interest, suggested that the Chain Bridge dam could be made 150 ft. high and would result in important economies. He has a plan for development which would cost less money, he says, and would insure the delivery of power in Washington at 3 mills per kilowatt-hour.

Col. Charles W. Kutz, the engineer commissioner of the District of Columbia, stated that the District commissioners believe that the report is entirely reasonable and the project capable of effective accomplishment. He pointed out, however, the desirability of keeping separate the federal project of developing the power and the District problem of obtaining a water supply.

William F. Ham, president of the Potomac Electric Power Company, inquired of the commission whether the Great Falls project is a part of the superpower plan which is recommended by the United States Geological Survey. He urged that all possible notice be given of the government's plans so that his company shall not expand wastefully its large steam plant.

Malicious Cartoon Reflecting on Water Power Development

THE CARTOON adjoining was published in the *Saturday Evening Post* of Jan. 29 and has created a sensation among the electric light and power people. It would be uncomplimentary to print the remarks emanating from the operators of hydro-electric systems, particularly those seeking permits for further development under the water power act. Not only is the cartoon malicious in their opinion because it will make it so much harder to finance water-power projects, but it is absolutely false in its portrayal. The water-power licensees, they claim, have no designs on the national parks whatsoever. Lumbermen, miners, and others, they say, may mar the natural beauties of our forests and parks, but the electrical engineers will not. Electricity, they claim, is the expounder of beauty, not its desecrator.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Electrifying the Liverpool Docks.—Progress is being made on the project to electrify the docks at Liverpool, England. In the case of the Hornby dock all the main cables have been laid, a generating station has been built and the installation of machinery and wiring of sheds is well advanced. Contracts have also been placed for the electrification of the Gladstone dock.

Total Horsepower of Electric Central Stations in United States.—A recent tabulation of the horsepower of electric central-station plants in this country gives the following figures: Steam engines, 1,781,000; steam turbines, 9,635,000; waterwheels, 3,377,000; gas and oil engines, 207,000; boilers, 3,895,000. Adding to this 19,050,000 hp. for electric generators, a total of almost 38,000,000 hp. results.

Accuracy of Electric Meters in Greater New York.—In the first ten months of 1920 the Public Service Commission, First District, New York State, which has jurisdiction over the public utilities of Greater New York, tested on complaint 700 electric meters. Of these 145 were found to be fast and 65 slow. Of the fast meters nine were from 4 to 10 per cent inaccurate and one was more than 20 per cent wrong. Of the slow meters three were from 4 to 10 per cent inaccurate and one was more than 30 per cent wrong.

A Sicilian Hydro-Electric Project.—Near Palermo, Sicily, according to a newspaper printed in that island, great hydro-electric works are being constructed by an Italian firm. The main reservoir will entail the submersion of more than 1,150 square miles. A waterfall of 1,580 ft. will be induced, which will be used for actuating three groups of alternating-current turbines, each rated at 3,500 kw. The plant, which it is hoped to have in full working order by 1922, will have an output of 16,000,000 kw.-hr. a year, which will be used for irrigation and industrial purposes.

Electrical Unloading in China.—If there were any place left in the world where the manual way of doing things would be cheaper than the electrical one would think that it would be China, with its overabundant supply of the cheapest labor. Yet a British member of the Engineering Society of China, writing in the London *Electrician*, describes how 3,000 tons of ore, limestone, coal and coke are daily being unloaded from the boats of the Han-Yeh-Ping Iron & Coal Corporation at Yangtze River docks by electrically operated grab buckets. The plant was erected by native labor under the direction of the English engineer, and when the latter left China 270,000 tons of material had been unloaded without an accident of any kind. The corporation, said to be the largest industrial company in China, is under native management and its $60,000,000 of stock is owned by Chinamen.

Electrical Accidents in Central Stations and on Systems of New York City.—Fifteen fatal accidents and thirteen others involving grave injuries to individuals occurred in the power houses and on the distribution systems of New York City electric light and power companies in the ten months ended Oct. 31, 1920, according to the Public Service Commission, First District. Total accidents of every degree of seriousness were 5,768, of which 4,951 were to employees and 817 to others.

Three-Million-Dollar Southern Corporation to Build Electric Plants.—A three-million-dollar corporation, the Union Power Company, organized at Shreveport, La., will, a dispatch to the *Manufacturers' Record* says, construct a number of large electrical plants in the Monroe (La.) gas field for the distribution of electricity for lighting and power purposes over north Louisiana, southern Arkansas and possibly points in Texas and Mississippi. The company, which is said to be amply financed, has acquired title to the natural-gas rights in thousands of acres and will begin immediately to construct gas-pipe lines and electric plants.

Work on Arkansas Hydro-Electric Project Soon to Start.—Work will begin on the dam for the hydro-electric power plant on the White River, above Cotter, Ark., just as soon as the drill can be set, according to a correspondent of the *Manufacturers' Record*, and a chamber of commerce is being organized to promote the industrial development of a territory about 150 miles long by 20 miles wide, extending from Newport to Yellville. The manganese, zinc, lead, phosphate, glass-sands, tripoli, cement, marble, sandstone, oil and natural-gas industries are among those which the promoters of the scheme expect to see developed with the aid of electric power.

California Public Utility Security Issues in 1920.—During the twelve months ended Dec. 31, 1920, California utilities—steam and electric railroads, gas and electric companies, water companies, telephone and telegraph companies, warehouse and steamship companies and motor companies—filed with the commission applications to issue securities that aggregated $179,668,083. The commission approved applications to the extent of $152,119,927, denied applications totaling $250,500, dismissed requests aggregating $3,491,560, and on Dec. 31 had pending applications totaling $50,678,783. In the official summary of the commission gas and electric companies are grouped together, their total security issues amounting to $82,515,708, as compared with $56,095,461 in 1919.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

New York Section, I. E. S.—At the meeting of this section of the Illuminating Engineering Society held Feb. 10 William V. Kelly gave a demonstration of the making of colored motion-picture films.

Akron Section, A. S. M. E.—C. Harold Berry of the Detroit Edison Company will speak on "The Heat Balance of a Power Station" before this section of the American Society of Mechanical Engineers on Friday, Feb. 25.

Iron and Steel Electrical Engineers.—"Methods Used to Insure Continuity of Service" will be the topic of E. D. Sibley of the Metropolitan Edison Company, Reading, Pa., who will read a paper before the Philadelphia Section, A. I. and S. E. E., on March 5.

Civil Engineers Hear Mr. Harper.—John Lyell Harper, vice-president and chief engineer Niagara Falls Power Company, addressed the American Society of Civil Engineers at New York City on Wednesday, Feb. 2, on "The Construction of the World's Largest Hydro-Electric Units."

Weather Forecasting to Be Discussed at Western Meeting.—Co-ordination of the efforts of various bodies to forecast weather conditions some months in advance will be attempted at a meeting to be held in the San Francisco Commercial Club rooms Feb. 18 under the auspices of the Technical Division of the National Electric Light Association. Prominent men from the Weather Bureau, the University of California and the electrical industry will address the meeting.

Coming Meetings of Electrical and Other Technical Societies

American Engineering Council—Syracuse, N. Y., Feb. 14. (See issue of Feb. 5, page 330.)

Association of Iron and Steel Electrical Engineers—Cleveland Section, Feb. 14; Birmingham Section, Feb. 19; Chicago Section, Feb. 19; Philadelphia Section, March 5.

New Mexico Electrical Association—Albuquerque, Feb. 14 and 15.

American Institute of Mining and Metallurgical Engineers—New York, Feb. 14-17.

A. I. E. E.—Midwinter convention, New York, Feb. 16-18. (For program see issue of Feb. 5, page 336.)

American Institute of Electrical Engineers—Chicago Section, Feb. 28; New York Section, March 11; Schenectady Section, March 18.

American Physical Society—New York Feb. 25 and 26.

Associated Manufacturers of Electrical Supplies—New York, March 15.

Wisconsin Electrical Association—Milwaukee, March 23 and 24.

A. I. E. E. (New York Section) and A. S. M. E. (Metropolitan Section)—New York, March 25.

Necessity of Co-operation Between Company and Patrons. — Urging the need for co-operation between central-station companies and their patrons in small communities, the Montana Public Service Commission, instead of granting increased rates to the Eastern Montana Light & Power Company at Wibaux, recommended the establishment of dusk-to-dawn instead of twenty-four-hour service and held the case open for a period of thirty days to allow the company and its consumers to come to an agreement on the period of operation.

Powers of North Dakota Commission. —The North Dakota Board of Railroad Commissioners possesses, it has asserted, full authority to exercise the police power of the state with reference to rate making, even where maximum rates may have been agreed upon in charters or franchises. This authority is in no wise limited by the provision of the utilities law providing for approval of a sliding scale of rates. The statutory power of municipalities in North Dakota to regulate rates of utilities by ordinance does not give an implied power to the municipalities to make binding contracts fixing rates.

Deposits to Cover Cost of Service Connections Prohibited.—The Public Service Commission of Pennsylvania has ordered the Eastern Pennsylvania Light, Heat & Power Company to desist from the practice of requiring deposits to cover the costs of making service connections, holding that electric lighting and power companies are not justified in demanding that a prospective consumer supply capital for the labor and material required to make such a connection and that they are sufficiently protected by the right accorded them to require a deposit from the customer to secure payment for electrical energy delivered.

Georgia Commission's Views on Rate Fixing.—In a decision granting increased electric light and power rates, gas rates and street-railway fares to the Georgia Railway & Power Company, the Georgia Railroad Commission declared it to be unfair to the public to prescribe rates exclusively upon a basis of value determined by the cost of reproduction new at a time when such cost is abnormally inflated. The commission did not make a special allowance for going-concern value or for good will, but took into consideration the added value in the physical properties themselves attaching because of their assembly, unification, adaptation and utilization in the purposes for which as a whole they were designed. The mere fact that a utility is operating under temporary emergency rates is no reason, the commission held, why it should not make a second emergency application if the conditions have so changed that existing rates are not sufficient. Rates should not be such as in themselves would supply new capital, but such as to justify capital investments in competition with other business ventures. Losses or inadequate returns in one department of a utility should not be saddled upon another department. The commission found a return of 6 per cent too low and indorsed rates designed to yield 8 per cent.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Free Service to Municipalities Condemned.—A provision in a franchise requiring an electric company to furnish electricity for lighting city buildings free of charge should be eliminated, the North Dakota Board of Railroad Commissioners has declared, since the expense of such service should be borne by all citizens benefiting therefrom and not entirely by the consumers of electrical energy. The rate for street lighting, the commission holds, may reasonably be lower than general lighting rates where a considerable portion of the evening and night load of the electric company is made up from the energy supplied for such street-lighting purposes.

Proposed 70 to 300 per Cent Increase in Municipal Power Rates Unreasonable.—In arranging an increased rate schedule for the municipal electric plant at Kiel, Wis., the Railroad Commission of that state found that under existing conditions an increase of 60 per cent was necessary, but disapproved as neither reasonable nor practicable the suggested power schedule, under which the rate for energy used under the first step would have been increased about 70 per cent, that under the second step 140 per cent, under the third step 200 per cent, and the excess between 200 per cent and 300 per cent. Under these proposed rates power customers using more than 250 kw.-hr. a month would have paid more for their energy than if purchased under the lighting schedule.

Contract Offending Interest of General Public Disallowed.—In dismissing an appeal for a rehearing of a case brought by consumers against the Pine Grove Light, Heat & Power Company, the commission having at the original hearing refused to sustain contract rates superseded by a new tariff, the Public Service Commission of Pennsylvania found from the testimony that complainant uses 80 per cent of respondent's output, for which the company receives 42 per cent of its gross receipts, and that the operating expense to furnish energy to complainant is 30 per cent less than for the rest of the service. The commission held that while a contract establishing field rates for a determinate period is some evidence of the reasonableness of the rates so fixed, under the conditions and limitations present in respondent's business, the contract in this case, if permitted to remain in effect, would offend against the interest of the general public, since the burden of the increase would be placed wholly on 58 per cent of the business.

Service Connection Charges. — In passing upon a new rule of the New Jersey Public Service Electric Company requiring the cost of service connections to be borne by the customer, the New Jersey Board of Public Utility Commissioners refused a change in the rule as to the former free limit and also held that where charges are permissible they should not be fixed sums but based on actual cost of materials and labor.

Satisfactory Service Essential Factor in Rate Adjustments.—Granting a revised schedule of electric rates to the Heppner Light & Water Company, serving Heppner, Lexington and Ione in place of the previous "inadequate, unfair and unjustly discriminatory" tariff, the Public Service Commission of Oregon insisted that more satisfactory service must be provided and recommended the immediate installation of a voltage regulator at the generating plant. For trouble due to the interference of shade trees with the transmission lines the commission held the company not responsible where there was no alternative economical location and suggested that it was the duty of the municipalities to remedy this condition by ordinance. An adequate minimum charge for large consumers under the commercial lighting schedule was provided. Increases granted were based in large part on the greatly enhanced price of coal, the commission noting in regard to general conditions of business that "reports from all electric utilities have shown in general a relatively large and abnormal increase in business during 1919 and 1920."

Coal Clause as Applied to Special Service and to Supply from Hydro-Electric Source. — The International Railway Company opposed before the Public Service Commission of New York, Second District, on two grounds the application to its contract of a coal clause granted the Buffalo General Electric Company. One ground was that its contract was of a nature different from that of other customers of the electric company, being for a longer term and containing conditions favorable to the supplying company; the other ground was that the power furnished it was generated by hydro-electricity and was therefore not affected by the price of coal. The commission has ruled against the railway company on both points, holding as regards the first that the advantages to the electric company embodied in the contract between the two companies had already been compensated for by a lower rate than other customers paid, and as regards the second that there was no stipulation that the energy furnished was to be hydro-electric and that the electric company was free to generate it by steam if it saw fit, regardless of what may have been thought implied.

Operation Under Contract Ratifies Acceptance by Agent.—Determining an action for breach of contract brought by the city of Paragould, Ark., against the Arkansas Light & Power Company, the Supreme Court of Arkansas declared that where a power company for more than a year furnished power as called for by a contract with the city it thereby ratified the acceptance of such contract by its agent if he had no authority to make such ratification. (225 S. W. 435.)*

Public Service Company Cannot Be Compelled to Furnish Breakdown Service to Competitor.—The New York Court of Appeals, which is the state court of last resort, has unanimously affirmed the order of the Appellate Division of the Supreme Court, made March 19, 1920, in New York Edison Company vs. Public Service Commission, First District, and Acker, Merrall & Condit Company. This order supported the electric company in its contention that it could not be compelled to furnish breakdown service to a competitor. (For an account of this important case see ELECTRICAL WORLD, April 3, 1920, page 806, and June 5, 1920, page 1338.)

West Virginia Public Service Commission Ordered to Hear Case Affected by Federal Injunction.—The Public Service Commission of West Virginia having held itself inhibited from passing on a case (Kelley Axe Manufacturing Company vs. Public Service Commission) involving a dispute between an industrial and a natural-gas company because of an injunction awarded by the United States Supreme Court forbidding interference with interstate transportation of this fuel, the Supreme Court of Appeals of West Virginia has ordered the commission to hear and determine the case according to law, asserting that the injunction does not prohibit the commission from fulfilling the duties which it was created to discharge while it refrains from infringing on the United States Constitution. (105 S. E. 152.)

Powers of Municipalities and Public Service Commission.—A state can authorize a municipal corporation to establish by an inviolable contract the rates to be charged by a telephone company or other public service corporation for a definite term, not unreasonable in point of time, according to a decision of the Supreme Court of Appeals of Virginia in City of Richmond vs. Chesapeake & Potomac Telephone Company, and the effect of such contract is to suspend during its term the governmental power of regulating rates. The authority to make the contract must, however, clearly appear, and all doubts will be resolved in favor of the continuance of the power of the state. Where express power to fix rates is not so conferred on a municipality, the state may through the State Corporation Commission direct a public utility

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

to increase its rates above those fixed by its franchise and the municipality cannot maintain a constitutional objection on the ground of impairment of contract. Although a city has the statutory or constitutional right to prohibit the use of its streets by public service corporations, this alone is insufficient to confer express power to regulate rates by inviolable contract. (105 S. E. 127.)

Federal Court Holds Valuation of Property on Pre-War Costs to Be Confiscatory.—Granting an injunction to the St. Joseph Railway, Light, Heat & Power Company against the enforcement of street-railway and steam-heating rates prescribed by the Missouri Public Service Commission, the United States District Court for the Western District of Missouri declared that a valuation based on the original cost where that was ascertainable, and otherwise upon prices during the pre-war period, was not a reasonable method of fixing the valuation in view of the greatly increased costs since the war and of the greater rate of returns earned by other enterprises, and that rates based upon such a method of valuation were inadequate and virtually confiscatory. (268 Fed. 267.)

Federal Judge Sanctions 25 per Cent Profit on Gas.—The constitutionality of the 80-cent gas-rate statute having been successfully assailed by the Kings County Lighting Company, that company, finding itself free from legal prescription of its charges, raised its rates to $1.50 per 1,000 cu.ft. The Attorney-General and the Public Service Commission thereupon made a motion to vacate or modify the injunction, alleging that the new rate is excessive. In the United States District Court for the Southern District of New York Judge Hough orally dismissed the motion, concluding his opinion in these words: "I consider the word 'inequitable' in the present connection to mean something so obviously wrong that it shocks the conscience of a fairly decent man who happens to be the chancellor. I believe that at the present time and for a time in the future, concerning which I cannot venture even to form an opinion, the most favorably situated gas-making concern within the limits of the city of New York cannot reasonably expect to make and distribute gas and pay interest (at rates now ridiculously low) upon the money it has borrowed in the past for less than $1.20 per unit, and this gas company, I am sure, is by no manner of means the most favorably situated within the city's limits. I am also of the opinion that a 25 per cent profit (which is the difference between $1.20 and $1.50) is, as a profit on anything, not so grossly inequitable as to shock the conscience of a decent man."

Validity of Election Favoring Municipal Acquirement of Electric Plant Sustained.—The voters of Summerville, S. C., having indorsed a proposal for the purchase, repair and extension of an existing electric light plant, the Bank of Dorchester agreed to buy the entire issue of bonds made for this purpose, but subsequently refused, attacking their validity on three grounds—first, that the projects of purchase, repair and extension should have been separately voted on; second, that the rate of interest should have been stated; third, that the fact of there being an ice plant connected with the electric lighting plant affected the validity of the issue. In Commissioners of Public Works of Town of Summerville vs. Bank of Dorchester the Supreme Court of South Carolina found for the plaintiff and affirmed the entire legality of the election. (105 S. E. 32.)

Customers of Power Companies Contesting Rates Entitled to Copies of Others' Contracts.—In determining an appeal from an order made in Salisbury & Spencer Railway Company vs. Southern Power Company (see ELECTRICAL WORLD, May 29, 1920, page 1284), in which it was held that the defendant should be compelled to furnish electrical energy to the plaintiff and other companies without unjust discrimination, the order in question being one requiring the defendant to furnish to the plaintiffs copies of certain specified contracts which it is claimed the defendant had made with other customers under substantially similar conditions, the Supreme Court of North Carolina affirmed the order, laying down the law as follows: (1) The petition by plaintiffs for such an order in suit for mandamus was proper; (2) the power of the court to prevent rate discrimination is inherent and independent of the law establishing the Corporation Commission and of the statutory law; (3) the Corporation Commission cannot authorize an electric power company to discriminate between consumers and such discrimination can be corrected by mandamus whether or not it results from a contract imposed by the power company, for while the court will not fix rates it will review the commission's findings if unjust discrimination is authorized; (4) contracts made by defendant power company with other customers establishing the fact that it is selling energy to them under substantially the same conditions at a less price than it is charging plaintiffs are material, and plaintiffs are entitled to have copies of such contracts brought into court; (5) no interference is implied with the right of the power company to apply to the Corporation Commission to fix the rates it shall be permitted to charge all consumers receiving such service. (105 S. E. 28.)

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

D. H. Redinger, assistant resident engineer in charge of construction work on the Big Creek hydro-electric project of the Southern California Edison Company, has been spending a few weeks

D. H. REDINGER

in the East on a combined pleasure and business trip. He has spent some time at the plant of the William Cramp & Sons Ship & Engine Building Company inspecting the waterwheels being built for the Big Creek extensions and the plant of M. W. Kellogg Company, which is furnishing piping for the job. Mr. Redinger has been connected with the Southern California Edison Company since the spring of 1916. He was born at Lawrence, Kan., Jan. 20, 1884, and was graduated from Kansas University with the degree of C.E. in 1911. His first work was in the Alaska coal fields in charge of an investigation party under M. S. Hibbard of the United States Land Office. He then joined the engineering staff of Stone & Webster, and was engaged on the original construction work at Big Creek in 1912 and 1914. In 1914 he was engaged in the federal Reclamation Service as field engineer in charge of irrigation work in the Salt River Valley, Arizona. From the fall of 1915 to the spring of 1916 he was a member of the California State Highway Commission at San Luis Obispo. This position he resigned to take up his present duties.

Melvin H. Coulston of New York has been appointed Commissioner of Patents by President Wilson. Mr. Coulston was formerly First Assistant Commissioner of Patents.

E. C. Rutz of Chicago has been appointed director of the Department of Public Utilities of the city of Kalamazoo, Mich. Mr. Rutz was electrical engineer for the Commissioners of Lincoln Park, Chicago, until 1913, when he resigned and joined the staff of the Woodmansee-Davidson Engineering Company, consulting engineers of Chicago. He left this company to take up his duties in Kalamazoo on Feb. 1.

George L. Hoxie has been engaged by the Southern California Edison Company as research engineer to make investigations of power resources and their conservation and most effective utilization. Dr. Hoxie was graduated from Cornell University as mechanical engineer in 1892 and later received the degrees of M.M.E. and Ph.D. from the same institution. The next ten years were spent in university work, his first permanent business connection being with Westinghouse, Church, Kerr & Company of New York. In 1905 he opened offices in New York City as a consulting engineer, and he has followed his profession continuously since that time. His counsel and services have been employed by public utility corporations and private enterprises throughout the country in engineering and operating matters. His connection with the Edison organization will per-

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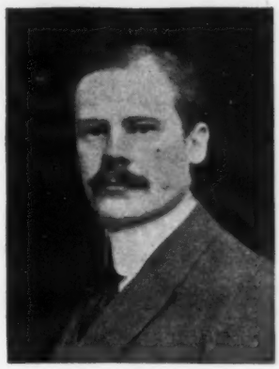
mit him to continue his professional activities. Dr. Hoxie has closed his New York office.

Ernst Fredrik Werner Alexanderson, who has been elected president of the Institute of Radio Engineers, is chief engineer of the Radio Corporation of America and consulting engineer of the General Electric Company. Mr. Alexanderson was born in Upsala, Sweden, Jan. 25, 1878, and received his technical education at the Royal Institute of Technology of Stockholm, Sweden, and at Berlin, Germany. He entered the service of the C. & O. Electric Company in 1901 and joined the engineering staff of the General Electric Company one year later. During the last eighteen years Mr. Alexanderson has been closely identified with development work on large alternators and high-frequency apparatus. He originated the development of the magnetic amplifier and was the first to introduce



E. F. W. ALEXANDERSON

iron into high-frequency circuits. In May, 1915, Mr. Alexanderson was in contact with Mr. Marconi in this country, with the result that the large radio-frequency alternator and magnetic amplifier for raido-telegraphic work, as designed by Mr. Alexanderson, was installed in the Marconi company's station at New Brunswick, N. J., and has since been adopted by the Radio Corporation of America for its chain of worldwide wireless stations. Mr. Alexanderson holds a number of United States patents. He is a member of the American Institute of Electrical Engineers, and he is also author of a number of papers which have been presented before various technical societies.

Francis J. Chesterman, chief engineer of the Bell Telephone Company of Pennsylvania, Philadelphia, gave an interesting talk on the subject of "Translating Thought by Electricity" before the local Rotary Club at the Bellevue-Stratford Hotel recently.

Dr. Robert B. Owens, secretary of the Franklin Institute of Philadelphia, his many friends will be glad to hear, is now on the road to recovery from eye trouble, from which he has been suffering for several weeks. It will still be some weeks, however, before Dr. Owens will be able fully to engage in his duties at the institute.

W. J. Davis, Pacific Coast engineer of the General Electric Company, has been transferred to the International General Electric Company and will soon leave for London and later for South Africa, where he will remain about one year studying the proposed electrification of the present steam railroad between Capetown and Pietermaritzburg, a distance of approximately 800 miles. It is also proposed to electrify suburban lines from Pietermaritzburg to Natal and Durban. It is understood that electrical energy will be obtained from coal-fired steam stations. The changes are to increase the capacity of this im-

W. J. DAVIS

portant trunk line, which is now operating nearly up to the limit of its capacity. Sir William J. Hoy is general manager of the lines, which are owned and operated by the government. Mr. Davis states that electrification will defer double-tracking fifteen years. Mr. Davis was born in Louisville, Ky., in 1869 and after being graduated from the Rose Polytechnic Institute in 1892 spent three years in construction work, at which time he entered the employ of the General Electric Company at Schenectady in the students' course. In 1898 he was transferred from the special testing department, where he was then foreman, to the railway and traction engineering department. He remained in this department for ten years and during that time was engineer on some of the most notable early electrifications. Among these was the Albany & Hudson electrification. This was the first steam railroad to be electrified and also the first to use converters in railway work. Other electrification projects on which Mr. Davis was employed included the Central London, the London Underground, the New York Central, the Detroit River tunnels and the West Jersey & Seashore. The latter was notable in that 8 miles of line was double-tracked and electrified, a 6,000-kw. power house and converter station was built, nearly eighty cars were supplied and the line was put in operation in six months. Mr. Davis has been in his present position for eleven years.

J. M. Thompson, an attorney of Caldwell, Idaho, has been appointed to succeed A. L. Freehafer as president of the Idaho Public Utilities Commission.

Louis B. Fasset, for many years connected with the Northern New York Utilities, Inc., Watertown, N. Y., has been appointed superintendent of distribution, succeeding R. B. McGinnis.

Frederick A. Kolster, electrical engineer of the Bureau of Standards, in charge of the commercial radio development work, has resigned his position and is to be associated with the Federal Telegraph Company, San Francisco.

S. H. Heller has been appointed vice-president and general manager of the E. L. Uncapher Electric Company, Louisville, Ky., jobber of electrical supplies, to succeed M. H. Moies. Mr. Heller was formerly general manager of the Central Home Telephone Company of Louisville.

Harvey Pond, formerly advertising manager of the Arrow Electric Company, Hartford, Conn., manufacturer of wiring devices, has been promoted to the position of general sales manager of that company. Kenneth J. Owens succeeds Mr. Pond as advertising manager.

Stephen Q. Hayes, who is associated with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., in its switchboard engineering department, is en route to Australia in the interests of the company. Mr. Hayes will establish an office in the Queensland Building, 84 William Street, Melbourne, Australia, and will remain there for six months.

Frank A. Burr, who has been engaged in engineering work with the Narragansett Electric Lighting Company and the Brown & Sharpe Manufacturing Company, Providence, R. I., for the past year, has been appointed to the faculty of the Rhode Island State College to take the place of Prof. R. L. Wales, who is engaged in research work for the Bureau of Standards, Washington, D. C.

B. C. Jones has been appointed superintendent of the Pittsfield (Mass.) porcelain works of the General Electric Company. Mr. Jones entered the employ of the Pittsfield works of the company in 1908, being assigned to the cost section of the motor department and having charge of fan and power motors, lightning arresters, disconnecting switches, etc. In 1912 he was transferred to the manufacturing superintendent's office, specializing on costs, investigation, factory layouts and equipment. During the war he traveled extensively in behalf of the conversion and provision of works for the production of war material under the company's responsibility, having general charge of this work. About a year ago he was made an assistant manufacturing superintendent at Pittsfield. He will report to C. C. Chasney, manager of the Pittsfield works, in his new post.

Dr. R. C. Rodgers, who was recently appointed assistant secretary of the Illuminating Engineering Society, served for fifteen years in the department of physics of Cornell University, from which university he was graduated in 1905 with the degree of M.E., obtaining later, through advanced work, the degrees of M.A. and Ph.D. He has been particularly interested in photometry and illumination for some years past. Since the retirement of Dr. Edward L. Nichols as head of the physics department at Cornell he has been in charge of the work in the physics of photography, further de-

R. C. RODGERS

veloping the courses originated by Prof. G. S. Moler, who retired in 1917. Dr. Rodgers is a member of the American Physical Society, the American Association for Advancement of Science, the Optical Society of America, the American Institute of Electrical Engineers, the Illuminating Engineering Society, the Cornell Engineering Society and the honorary society of Sigma Xi. His duties with the Illuminating Engineering Society will be in the direction of promoting its interests and expanding its activities and influence. He will assist the chairmen of committees, where possible, in their work.

Obituary

Wilbert H. Doughty, a prominent contractor-dealer at Fall River, Mass., died at his residence in that city recently after a short illness. In July, 1920, Mr. Doughty retired from membership in the Doughty & Welch Electric Company, Inc., at Fall River. He was born at Brunswick, Me., about fifty-four years ago, and his earlier career included service as a traveling representative of the old Thomson-Houston Electric Company and the Thomson Electric Welding Company of Lynn, Mass. For a time he was in charge of the motor department of the Fall River Electric Light Company.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Aluminum Conductor Bookings Show Increase

CONTRARY to conditions existing last year in the aluminum field there is now sufficient capacity available, both raw material and mill, to place aluminum conductor production on a satisfactory basis. Less than a year ago there was little metal that could be turned over to conductor business, but with a decline in output in the automotive and other fields and an increase in orders for conductors there is now plenty of capacity at hand which it is expected will be devoted permanently to that trade.

There have recently been placed several orders of good size for aluminum conductor, and the outlook for the future is reported particularly bright. Ingot aluminum, 98 to 99 per cent virgin is quoted now at 28 cents a pound. With 14-cent copper the first cost of these two metals would be about on a par when it is considered that aluminum for equal conductivity weighs just under one-half what copper weighs.

Early Fan Orders Below Expectations

WITH 1921 production of large fans well on the way toward completion, contracts on the part of distributers are somewhat disappointing. True, there have been many orders placed with manufacturers, but at the same time a great many distributers have held off and say they will continue to do so for another month or so. The general unsettled conditions of business, although an upward trend is noticed; large stocks carried over and the fact of a price advance of up to 10 per cent over last year's prices are the reasons given for this hesitation.

The endeavor of the past few years on the part of the producers to encourage distributers to place their contracts early in the year, in order to get the best deliveries and to give manufacturers something in the line of orders to work on, began to bear fruit last year in a great many cases. But transportation tie-ups counteracted this measure. This year business conditions are hindering this early ordering.

As conditions stand now, fan prices will be about 10 per cent higher this season, although manufacturers are protecting the dealer against a drop in price. The facts of the case rest on production costs. The materials going into the fans were ordered at least by last summer, and production was started before a drop in both the price of materials and of labor became effective. Consequently the fans that will go on the market this year will have cost the producer more than they have at any other time.

There is a feeling among the trade, however, that these prices will be too high to suit the consumer and that sales will suffer. While it is generally thought by producers that sales this year will equal those of last year, a record year, there are some who feel that this question of price will have considerable effect. Production is going on on the basis of that of last year.

Stocks of fans among the trade vary. In the East stocks are large and advance ordering is light. Last season was not good fan weather there. Hence the hesitation in contracting. Stocks are fairly large in the Middle West, and there, too, ordering is light. The Pacific Coast is pretty well cleaned out. The South is always a good market, and stocks there are low. Consequently pretty fair orders have already been placed from that section.

As to types, it is thought that the 8-in. to 12-in. sizes will have an increased sale this year in proportion to other years and that the 16-in. will suffer somewhat. Much stress is being placed on the fan for residential uses, and this naturally caters to the smaller sizes. The smallest size has not been considered in this discussion, but will be taken care of at a later time.

Several manufacturers have already shipped quantities of stock to distributers, but these are resting quietly in the latters' warehouses, as the dealer buying is light.

An increased capacity is being devoted to the production of ceiling fans. The phenomenal run of these last year surprised the trade, and hold-over stocks are negligible. The same price advance has been applied to these.

Pole-Top Arrester Deliveries Ruling Short

LIGHTNING arresters of the pole-top type are responding to a fair movement already this year, especially in the Middle West. Some good orders have been going through in the far West and in the East too, and from the volume of inquiries coming in to manufacturers some nice buying should be in prospect.

In small quantities stocks can be tapped to supply orders on the 2,300-volt equipment, and from stock up to two and three weeks is quoted on other voltages and in large quantities. No price changes have been reported up to date. This is still a grave question with many central stations, and some are withholding purchases in expectation of a possible recession. It is known that many lines have been allowed to remain without lightning protection in the last few years and some have been put in without it.

Hopeful Year Seen in Washing Machine Industry

AT THE last meeting of the American Washing Machine Manufacturers' Association, Jan. 19 and 20, the general feeling prevailing among the members was that the washing machine industry was already beginning to come up out of the depths which all fabricated products have found themselves in during the last ninety days. This feeling of optimism, according to Enoch B. Seitz, the secretary, was based not on hopes but on substantial orders.

While recuperation was not expected to come fast, a steady improvement was looked for. The belief has been expressed that more intensive sales effort will be made by this industry than ever before and that the methods of merchandising will stand the most rigid inspection. The outlook for what is termed a wonderful year is predicted, starting slow but finishing stronger.

Pole-Line Hardware Manufacturers See Good Business Ahead

THE market for pole-line hardware is only fair from the standpoint of buying. The present month is usually a period of light buying, but though it is true some utilities are covering their spring needs the general demand is considerably less than normal. As far as prospects for good business go, however, the situation is very favorable, according to several manufacturers. Almost without exception producers express confidence that the contemplated extension of power lines by electric railways and central stations will result in heavy buying in the coming spring.

In accordance with this view some hardware producer

are going ahead with production, although on a curtailed basis, for the purpose of piling up reserve stocks. In one instance the value of surplus stocks now held at the factory amounts to half a million dollars. Other manufacturers have only recently caught up with back orders and so are not able to ship large quantities of other than standard material from stock. Deliveries, on the whole, are good, ranging from stock up to two or three weeks.

Prices have held steady since general decreases, ranging from 5 to 15 per cent, were made during the month of December and the early part of January. In some quarters still lower prices are expected, but in others the view is expressed that present quotations will hold steady.

Trade Pitfalls and Possibilities in the Orient

THERE are three major reasons why British and not American concerns have the great bulk of the electrical business in the Orient, and more particularly in China," according to F. K. Pinckney of the Macbeth-Evans Glass Company. In an interview with a representative of the ELECTRICAL WORLD, after a first-hand investigation of conditions in the Far East, Mr. Pinckney enumerated these reasons as follows: "First, Americans have not appreciated the great possibilities for electrical business in that part of the world; second, they have chosen unsuitable representatives, and, third, they have insisted on short-time credit when foreign competitors have been giving virtually as much credit as was necessary to get the business, which means anywhere from three to six months.

"Electric light," Mr. Pinckney continued, "is used extensively and lavishly in Japan, and its use is growing very rapidly in China. In Japan municipal hydro-electric plants are the rule, and the service is sold on a flat-rate basis as a natural sequence. In China, however, private companies supply most of the electric service from steam-driven generating stations, and the service is consequently metered.

"Glassware, such as it is; incandescent lamps all the way from Christmas-tree sizes to large gas-filled units, flash-light batteries and lamp sockets are manufactured in large quantities in Japan. Some of these products are being exported to this country, to China and elsewhere, but a Chinaman would not buy anything made in Japan if he could possibly get something else. Ultimately these and other electrical devices will probably be made in China, but that may be a long time off, and in the meantime the British are capitalizing the Chinese aversion to the Japanese product and are doing a large and increasing electrical business with the Celestial Empire.

"China should be a very fertile field for electric signs, because the Chinaman is a great believer in advertising and uses electric light very profusely.

"Both the Chinese and the Japanese are accustomed to cheap things, and that is what they want to buy. However, they will pay more for a better article when they are shown that the advantages outweigh the difference in price. That is now being demonstrated by the increasing demand for modern American glassware. One concern in Tokyo has up-to-date lighting demonstration rooms and employs an illuminating engineer, trained in America, to educate its salesmen.

"Europeans would lose the respect of the natives if the women attempted to do their own housework, so there does not seem to be much of a field for the essentially labor-saving electrical devices for the home. However, hollow ware, floor lamps, electrically operated phonographs, refrigerating machines, etc., should find ready sale among the European populations of the large cities. There is also a large field for electric fans, as the punkas, formerly used for cooling large assemblages, are rapidly being discarded.

"The meter requirements of China are growing rapidly, while both China and Japan are using a greater amount of insulated wire, wiring supplies, switches, motors, generators and central-station accessories. There is much more American apparatus to be found in Japan than in China, where, as previously stated, the British are getting most of the business. Throughout the Far East their bayonet-socket lamp remains the standard. The British have shown wise discrimination in trading through English or Chinese concerns. One of the Chinaman's characteristics is that it is against his principle to make an advance payment with an order or to pay for goods before they have been received."

Small Electrical Sheet Tonnages Being Booked

THERE is little activity in the electrical sheet market. In the first place manufacturers of motors, generators, transformers, etc., using electrical sheets are working on a much reduced schedule, as a whole, especially manufacturers of small motors. In the second place, these same manufacturers last summer and fall had to order their sheets well in advance and in pretty good volume in order to cover their needs in what might have turned out to be a very tight market.

But the break in demand came, and these stocks of sheets have not all been used up. Under the present feeling of uncertainty in the nation's industries manufacturers are not ordering in advance and current needs are relatively light. True, some tonnage is being booked, even in carload lots, but these large lots are few and far between. Small tonnages too are slipping through.

Prices of electrical sheets of various mills are on a par, and there is sufficient capacity available to supply most needs on short notice. There is a feeling among the mills, however, that business will pick up in March and show a much better tone.

The Metal Market Situation

POSSIBLY as a result of the proposed plan of the Copper Export Association, mentioned in last week's issue, to take 400,000,000 lb. of copper off the market by pooling it for export sales and issuing debentures at 8 per cent interest, which will be retired as the copper is sold, there is a firmer tone to the market. Prices in both the major and outside markets have advanced from ¼ cent to ½ cent over a week ago. This is a result not so much of increased domestic demand, as copper consumers in this country continue to hold off buying to see how things break, but of stronger buying interest from abroad.

Producers are generally asking 13 cents delivered for prompt and February shipments, 13¼ cents over March and 13½ cents for the second quarter. In the outside market prices have become firmer until they are generally ¼ cent per pound higher than producers'.

Outside of copper there is little or no change to metal prices this week. The market for lead is quiet but steady, little buying interest being shown. Tin is also inactive at present, following better inquiries a few days previously. The price of tin receded ¼ cent per pound the past week. Zinc presents a slightly steadier tone under a better demand, which may possibly be but temporary.

NEW YORK METAL MARKET PRICES

	—Feb. 1, 1921—	—Feb. 7, 1921—
Copper	£ s d	£ s d
London, standard spot	69 10 0	72 0 0
	Cents per Pound	Cents per Pound
Prime Lake	13.25	13.50
Electrolytic	12.75	13.00–13.25
Casting	12.37½	12.62½
Wire base	15.75	15.75
Lead, trust price	4.75	4.75
Antimony	5.25	5.25
Nickel, ingot	43.00	43.00
Sheet zinc, f.o.b. smelter	11.50	11.50
Zinc, spot	5.50	5.50
Tin	33.00	32.75
Aluminum, 98 to 99 per cent	28.00	28.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	11.00–11.25	11.00–11.25
Brass, heavy	6.00– 6.50	6.00– 6.50
Brass, light	4.00– 4.50	4.00– 4.50
Lead, heavy	4.00– 4.25	4.00– 4.25
Zinc, old scrap	3.00– 3.25	3.00– 3.25

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

STILL more evidence seems to be apparent this week of a better tone in the electrical market. Jobbers as a whole do not report substantial increases in volume of orders taken, but they do say that from the inquiries received they believe the trade is thinking better and feeling better. Resumption in building, especially residential building, is going on well in Seattle, but in other sections is quiet. However, a general feeling is prevalent that the volume will be quite satisfactory by May. Supply stocks are good for immediate needs, but there is little ordering for future business, regardless of the probability that a building boom would quickly reduce stocks to a low level.

NEW YORK

There seems no longer to be any doubt that the turn of the tide has been reached. From this time on conditions in the electrical trade in this territory should gradually improve. That appears to be the consensus of opinion among jobbers. Many of them cannot report any better actual sales, it is true. Some, on the other hand, are finding a larger total volume of orders. The common meeting ground is that the bottom point of buying has been reached. A generally improved tone, a feeling of optimism, a firmer basis is evident to the market. An increasing number of inquiries is reported, indicating that a good potential demand exists.

A reflection of this fact is found in the policy of several manufacturers of going ahead and producing goods for stock. Jobbers, however, are still ordering material only as they actually need it. Stocks consequently are held down to as low levels as possible to conform to the light demand which it seems must still exist for some time to come.

Collections in the metropolitan district, it seems, have been reported in rather more pessimistic vein than the actual average situation warrants. A representative collection would probably range close to sixty days, but the majority of jobbers state that in view of the care used in granting credit collections occasion little trouble.

Rubber-Covered Wire.—A few jobbers are making fairly good sales to industrials in small lots. The general demand is light, however, with stocks held as low as possible. Nominal quotations for No. 14 in 10,000-ft. lots this week range all the way from $7.75 to $9.50 per 1,000 ft.

Conduit.—Small orders are received in fair volume in some cases, but the market is quiet with adequate stocks on hand. In 2,500-ft. lots, ½ in. black varies from $70 to $79 per 1,000 ft. and 1 in. black from $137 to $155.

Flexible Armored Conductor.—Slight signs of a strengthening market are noted. Several jobbers report a fair volume of orders. The general policy is to replenish stock only as necessary. No. 14, two-wire double-strip, in 1,000 ft. quantities brings from $61 to $66 per 1,000 ft.

Cable Boxes.—W. A. Bonnell, New York City, announces a price reduction of 25 per cent on cable boxes, effective Feb. 5.

Tape.—Demand, on the whole, is quiet, the best report on sales being "fair." Stocks for the most part are not considered too large. Standard grades of friction tape range from 48 to 50 cents per pound, in 100-lb lots, and rubber tape from 42 to 50 cents.

Outlet Boxes.—Sales are light with very small quantities in stock. Some jobbers, in fact, are cleaned out.

Fans.—Very little buying has been done for the coming season in this district. Stocks held over from last year are large, and there is a feeling in the trade that prices announced last fall are rather high.

Lamps.—No falling off is reported in the good volume of sales that has been recorded to date this winter. Prompt shipments prevail, and stocks are generally full in all sizes. The Edison Lamp Works at Harrison, N. J., is back on a five-day week basis.

Porcelain.—Until further notice the American Jobbers' Supply Company announces that it will disregard the price increase of 10 per cent on knobs, tubes and cleats announced in last week's issue. The R. Thomas & Sons Company, East Liverpool, Ohio, has revised its price list on standard porcelain, effective Jan. 26. On some items the change is an increase, on others a decrease, the revision in both cases ranging from 5 to 10 per cent.

CHICAGO

Regardless of how poor other business is, the electrical line runs along with sufficient volume to prevent any real discouragement. Manufacturers and jobbers alike state that January billing reached a comfortable total and that, leaving the first half of 1920 out of consideration, business is very close to normal. An encouraging feature is that in many cases stocks have been well cleaned out, which will necessitate the placing of additional orders as rapidly as consuming demand develops. Close co-operation is found between manufacturer and jobber to the extent that in many cases jobbers' inventories are being submitted to the manufacturer for suggestions as to how heavily to order. This should insure sane business in the approaching season.

The worst feature remains in slow collections. Jobbers report sixty days or more as the average, and manufacturers in some cases are running behind that. Relief seems to be in sight, however, in that manufacturers with national distribution report conditions in the East as being better. This improvement, it is hoped, is traveling westward, as did the wave of depression last fall. In general, prices are firm, there being no quotable changes. Chicago building took a slight spurt this week, new permits amounting to $1,450,000 having been issued, two-thirds of this amount being in one large apartment building.

Motors.—Jobbers state that business has settled back as regards volume of orders to about where it was before the war and is confined almost wholly to replacements.

Fans. — Manufacturers anticipate rather light business in the approaching season as most jobbers and dealers, as a result of the cool summer last year, went into the winter with considerable stock on hand. The price element is a subject of much question, but no line on the future can be obtained.

Lamps. — Railroad buying, so great a feature a few months ago, has almost entirely disappeared. Domestic business continues good, and the trade feels that it will be better, as it is known that there are millions of empty sockets in the country. Undoubtedly the public's expectation of lower prices is acting as a drag. Prices are firm, and there is no indication that waiting will permit cheaper buying.

Fuses.—Fuse business is "going along." Stocks are full and orders can be filled on receipt. Prices so far remain firm. Reduction of industrial activity throughout the country has resulted in much less consumption of fuses, and this line will probably remain steady on a reduced level for some time.

Hollow Ware.—Manufacturers report that January was the best January in the history of the business with the exception of last year. Conservativism is the rule with jobbers, and they are consulting freely with manufacturers as to how large stocks they should carry. Retail dealers still have some stocks on hand.

Air Heaters.—Although the weather is mild in Chicago, some heaters are still being sold to supplement or take the place of furnaces. All elements of the trade report the past season to have exceeded expectations.

BOSTON

Slow improvement characterizes the trend of business, which continues spotty throughout New England. The Boston building strike has reduced buying in local jobbing circles, but industrial orders and public utility purchasing hold up fairly well. Collections are poor. Stocks are ample in nearly all lines except watt-hour meters, which are very scarce. Prices are firm except where the pressure of accumulated stocks has been strong enough to induce distributers to make cuts. Field men in jobbing organizations report a more hopeful outlook in local territory, and orders, while not heavy, are well distributed and numerous. Deliveries are satisfactory in most lines. New office-building construction is in prospect at Worcester, Mass., on sites recently swept by fires, and important hotel construction is scheduled for early advancement at Providence, R. I.

Meters.—Jobbers are unable to accumulate stocks of any real size. One of the largest houses was cleaned out Monday and was ordering meters on a fourteen weeks' delivery basis.

Fuses.—Prices are steady and stocks good. A leading distributer reports improvement in the sales of the last fortnight compared with any other of the last two months.

Tape. — Sluggish movement features the tape market. Prices are unsteady, but sales averaging around 50 cents per pound are common for ¾-in. black, in 100-lb. lots. Compound is selling around 42 cents to 45 cents in the above quantity. Stocks are large.

Insulators.—Buying is moderately good and stocks are fair. The 2,300-volt porcelains are selling around 14 cents to 18 cents according to quantity.

Flexible Armored Conductor.—Prices are steady, two-strip No. 14 selling at $67 per 1,000 ft. in 1,000-ft. lots. No trouble is experienced in getting this material by stock shipment.

Wire.—Prices are unstable in bare copper wire, the base ranging around 16½ to 17 cents on the average, with fluctuations of a cent or two on either side in extreme cases. Central stations are displaying more interest in the wire market. Weatherproof base Monday was about 18 cents, and rubber-covered No. 14 wire sold at $8.25 per 1,000 in 1,000-ft. lots.

Rigid Conduit.—A quiet market prevails for this material, with only nominal differences in prices against last week's figures. A leading house was putting out 1-in. black pipe in less than 2,500-lb. lots Monday at $164.55 per 1,000 ft., the galvanized selling at $174.85. The ½-in. black sold for $84.02 and galvanized at $89.12. Deliveries have been helped greatly by the mild winter.

Non-Metallic Flexible Conduit.—Unsteady prices are reported. In 1,000-ft. lots the ⅜-in. size was selling Monday as low as $22 per 1,000 ft., and the ½-in. size at $25. It was stated that these prices were set to meet cuts under close competition. Stocks are substantial and the demand is not very large.

Appliances.—The demand for washing machines shows improvement over the last two months of 1920, according to a leading distributer. Consistent campaigning is yielding returns. Cleaners are moving slowly and radiators are rather quiet, pending the advent of the between-season demand.

Cross-arms.—Stocks are reasonably satisfactory and buying has not as yet developed any spurt.

ST. LOUIS

Activity during the past week, according to reports from leading jobbers, has been decidedly spotty. With one large jobber reporting the week as one of the best in some time, sales of wiring supplies having increased noticeably, another jobber reports no improvement over the previous week and still another reports sales very low. It is difficult to discover any definite trend to the market. There is a generally hopeful feeling, however, in spite of the unsettled conditions. This is probably the result of a considerable number of inquiries from and, in the case of at least one jobber, a considerable number of sales to industrials. Practically no orders have been very large but they are steady, and the volume is being built up bit by bit.

In regard to the building situation, if all the construction now in the proposed stage is put under way between April and September, there will probably be as large a shortage of that line of supplies as there was during 1919. Actual building operations at present are negligible. Credit departments by dint of much hard work are maintaining collections around sixty days.

Fans.—Jobbers are beginning to sound out retailers on the coming season and are finding in a number of instances that dealers have carried over stocks from last year. In any case, they report, there are few dealers who will be willing to tie up much capital in fan stocks, most of them preferring to buy as fast as consumer demand develops. The increase in the price of fans over last season will also tend to keep dealers from buying heavily.

Lightning Arresters.—Inquiry is very lively, and sales have improved considerably. This may be traced to the desire of central stations to prepare for the maintenance work that will come in the spring. Deliveries have improved somewhat, from eight to ten weeks being promised locally.

Fittings.—Flexible-armored-conductor fittings are in fair demand, and jobbers have ample stocks. Jobbers are having no difficulty in obtaining all they want and are quoting at $7 per 100.

Ranges.—Little effort is being made to push range sales, and several jobbers are carrying large stocks. It is felt that present prices are too high to permit very heavy sales.

Lamps.—Lamp sales continue strong. Jobbers estimate them as slightly below those of last year, but the difference is not nearly so large as that observed in other items. Stocks are complete. The type C street-lighting lamp is in good supply, and jobbers are moving them steadily.

Rigid Conduit.—The market for rigid conduit is practically non-existent, almost all the wiring work being outside, but prices are holding well. Representative quotations are $77 per 1,000 ft. of the ½-in. black and $150 per 1,000 ft. of the 1-in. black. Supplies are heavy.

Wire.—Increased activity is noticeable here, much to the relief of some jobbers who have been carrying large stocks. The orders are generally small, running from 1,000 ft. to 5,000 ft. individually, but enough of these small orders were billed during the week to make up a satisfying total. The demand is coming mainly from industrials, with very few orders from contractor-dealers. Prices are about the same, No. 14 rubber-covered being quoted between $8 and $8.50 per 1,000 ft., with other wire prices in line.

Farm-Lighting Plants.—Demand has not quickened as yet, but intensive sales campaigns are being figured on for the spring. Stocks are generally large.

ATLANTA

Reports continue to be received of the reopening of industrial plants throughout the section, the textile industry in particular showing a considerable reawakening. This will, of course, naturally stimulate retail trade in all lines and should materially improve general conditions. Reports are current that the retailers expect a resumption of trade within the next thirty days and are placing orders in anticipation of this event. Jobbers are lending considerable assistance to retailers in sales promotion work, such as laying out selling campaigns for various classes of electrical merchandising. One of the principal jobbers reports his wholesale business approximately 25 per cent below that of December, though slow improvement is expected. Building activities throughout the section remain sluggish in spite of low price of materials and low labor rates. The building permits for Atlanta for the month of January number 189, valued at $586,909. This inactivity of building is causing the market for electrical building material to continue slow, as retailers and contractors are unable to anticipate their spring demands.

Local bank clearings are off 30 per cent, and collections

on the average are the worst they have been for the past several months.

Heating Devices.—This line has not recovered its volume of holiday trade, though in the aggregate jobbers report material moving satisfactorily. For the first time in several months stocks are reported in good shape with shipments coming through regularly.

Pole-Line Hardware.—The movement in this line is reported on the increase, with stocks and shipments in satisfactory shape. Prices were reduced on this item several weeks ago and possibly served to stimulate the demand. Prices, cross-arm braces, lots 100 to 500, 20-in., $13.49; 26-in., $17.50; 30-in., $20.15 per 100. Lag screws, ½ in. x 4½ in., $5.63 per 100. Through bolts, ⅝ in. x 12 in., $15.47.

Industrial Lighting Equipment.—There is little activity in this line, buyers purchasing only for very necessary requirements. A reduction in price seems to be demanded by the trade. Stocks are in good shape, but jobbers report no expectations of revival in demand before the early spring.

Fans.—Several of the jobbing firms have begun to close contracts for fan deliveries. Shipments to local stocks are being received and forwarded to retailers in the southern part of this section.

Flexible Armored Conductor.—The continued high price of conduit is stimulating the sales of this line, which was sluggish for so long. Jobbers report orders coming through fairly satisfactorily, while a price advance of 10 per cent has just been announced. Stocks are from good to heavy throughout the territory.

Porcelain.—Jobbers are skeptical on the possibility of a 20 per cent price advance. Stocks are in fair shape and moving satisfactorily, with shipments still somewhat slow.

Washing Machines.—Little or no activity is reported in the washing-machine market, sales having fallen to a minimum. All jobbers have heavy stocks on hand, though they expect to be able to reduce them by active sales campaigns in the next few weeks.

Vacuum Cleaners.—Steady sales are noticed, especially in the larger centers, though demand for a price reduction by consumers is becoming more pronounced.

Sewing Machines.—Few orders are being received, and most jobbers report themselves overstocked.

SAN FRANCISCO

A stronger note of optimism and better business distinguished the opening week of February. Building operations are still dropping, but the encouraging feature is the better buying morale of the public.

The value of the building permits issued in the principal California cities during January, 1921, is as follows: San Francisco, $1,246,808; Oakland, $546,239; Los Angeles, $3,096,579; San Diego, $499,342; Fresno, $341,550. The value of the building permits issued during January, 1920, was as follows: San Francisco, $1,636,268; Oakland, $548,693; Los Angeles, $4,186,266; San Diego, $277,280; Fresno, $875,540. These cities are typical of their different sections. The big increase in San Diego's building is no doubt caused by the increased prosperity of the district with additional railway service and through extensive building opreations by the United States government. On Feb. 1 400 linemen of the Great Western Power Company struck because of a wage reduction, but company officials say that only a few more than 100 are out now. The building trades unions of San Francisco recently signed an agreement with the employers providing that future wage differences shall be submitted to a board of arbitration, which seems to indicate a definite end to future disastrous strikes.

Sewing Machines.—Sewing machines have recently dropped in price, the standard portable vibrating models now retailing in the neighborhood of $60. Sales are better, and it is noticeable that dealers are now carrying a greater variety both of models and makes in their regular stocks.

Electric Ranges.—Although range sales are quiet, power men are predicting big sales within the next few months because of the increased power ready for distribution. Prices are now on a quantity basis. The average family-size range retails for about $220 and costs the dealer approximately $175 in single lots or $160 in lots of three with the privilege of assortment with other sizes.

Ironing Machines.—An enhanced interest in ironers is noticeable, with the demand veering to machines whose rolls are of a greater diameter. The 46-in. seems to be quite popular now.

SEATTLE—PORTLAND

Building construction in Seattle, particularly residences since the first of the year has shown steady improvement and this improvement naturally is redounding to the benefit of electrical jobbers, supply houses and contractor-dealers. The action of the master builders' association in reducing wages 20 per cent, effective Feb. 1, coupled with decreasing costs of building material, are bound to stimulate new construction. It is the consensus of opinion that prospective builders have decided that costs of building have dropped as far as they will go, that the bottom has been reached and that now is the time to build.

Prices along all lines of electrical materials are holding. Quite recently there has been some price cutting on socket heaters and certain hollow-ware appliances by retailers who overstocked for Christmas trade. Stocks along all lines are reported in excellent condition, and shipments are coming through in an entirely satisfactory manner. Sales are quickening perceptibly and are slightly in excess of those of last year for the same period. Collections are reported fair to medium and improving slightly. About 50 per cent of lumber mills are operating, some on a three-day-week basis, and logging camps are beginning to resume. Wages are being cut in every line of industry.

Portland manufacturers report that business continues about the same as in the past two weeks. Collections are very poor. Stocks are improving and manufacturers are still behind in orders but are rapidly gaining. Inquiries regarding new projects are appreciably increasing and the future looks very bright. Portland jobbers report business fair and collections worse, if possible, than they have been. Prices continue on a downward trend, recent drops being noted in conduit, loom, wire, etc. Dealers report business slower, with cash sales only fair and charge accounts about the same in number but less in quantity. Contractors in this section state that business is not very active but that the immediate future looks bright. There is a great deal of activity in building permits at this time.

SALT LAKE CITY—DENVER

There is a general impression that business is gradually emerging from the condition of inactivity and depression, but the change to a new status is slow. The retail market is a little livelier than it was a month ago, with dealers showing a stronger tendency to place orders for business a month or two ahead. The credit situation is still in a bad way, showing possibly a slight improvement. Conservatism in planning future merchandising operations is still the rule. There are rumors of big building projects that will get under way in early spring, much of which pertains to line construction. Fortunately there will be no scarcity of stocks when the resumption of building begins. Jobbers are beginning an active campaign to get dealers to stock for the spring trade in vacuum cleaners.

Washing Machines.—Apparently a point of price transition has been reached and dealers are looking forward to a general decline. One of the largest American manufacturers has announced a reduction of $5 on a dolly type of washer. The demand is good and stocks more than ample to supply the trade.

Vacuum Cleaners.—Prospects point to a big spring consumer demand, and dealers are preparing accordingly. No price easing has been noted. The general notion prevails that manufacturers mean to hold up the price and increase their advertising campaigns. Many of the best-known cleaners can be purchased on time-payment plans, and this provision has a decided tendency to stimulate buying.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Robbins & Myers Brantford Plant in Operation

The Brantford (Ontario) plant of the Robbins & Myers Company has placed in production the company's 8-in. fan. Machinery is now being installed there to build the ½-hp. repulsion-induction motor and the polyphase motor line up to frame 202. This takes in polyphase motors up to and including 3 hp., 1,700 r.p.m., 60 cycles, and 2 hp., 1,400 r.p.m., 25 cycles.

Dodge Acquires Gray & Davis House-Lighting Unit

The sole ownership and manufacture of the house-lighting system formerly marketed by Gray & Davis, Inc., Cambridge, Mass., has come into the possession of H. C. Dodge, Inc., machinery manufacturer, Alger Street, Boston. This "D-Light" unit is now manufactured under conditions that permit of a larger volume of production than formerly, according to the new manufacturer, because it is built in a plant where the facilities are exclusively devoted to this one product. The company is producing on a volume basis this 350-watt, 32-42-volt set, and is in a position to expand its representation throughout the country.

Wage Reduction at Graton & Knight Plant

A reduction of about 20 per cent in the wages of all employees was placed in effect at the plant of the Graton & Knight Manufacturing Company, Worcester, Mass., on Jan. 31. L. L. Harr, vice-president, informed the ELECTRICAL WORLD that the step was necessary in order to continue to provide work for the employees. During the past half year this company has noted a marked tendency toward the purchase of belting for group-driven installations instead of a trend toward individual belt driving.

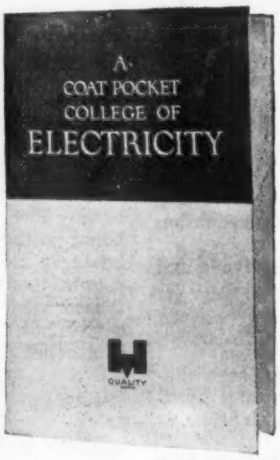
Question of Advertising Account in Receivership Claims

Exceptions have been filed in the Circuit Court at St. Louis to the report of the receivers of the Blue-Bird Washing Machine Company, disallowing the claim of the Gardner Advertising Company for $73,659.08. It is alleged that the receivers acted unlawfully in rejecting the claim, and that by so doing they seek to deprive the advertising company of its property and rights without due process of law, in violation of the federal and state constitutions. The court has been asked either to hear the claim or to refer it to a special master.

According to the exceptions, the claim is for advertising in various periodicals the product of the Blue-Bird Company and for preparation of the advertisements. These were placed by the Gardner company on contracts. The work was done prior to the receivership in May, 1920.

Edison Electric Appliance Starts Salesmanship School

To meet the new conditions arising from the pressure of competition and the awakened sense of thrift of the buying public, and to provide better and more intensive methods of selling,



PROSPECTUS GIVING SCOPE AND INTEREST OF COURSE IN SALESMANSHIP

the Edison Electric Appliance Company, 5600 West Taylor Street, Chicago, has launched a school of salesmanship. This school is for the use of all engaged in the selling of any kind of electrical appliances, says J. F. Roche, advertising manager of the company, and tuition is free. It covers the principles of salesmanship and advertising and the fundamentals of electricity and includes window trimming, store management, direct mail campaigns, and so on. Within the past two months 2,000 have enrolled, though very little publicity has been given to the school, and the company expects that the enrollment will be as high as 30,000 among its own dealers, central stations and jobbers. The scope and interest of the course is set forward in the prospectus, "A Coat-Pocket College of Electricity." John B. Mannion, formerly correspondence counselor of the La Salle Extension University, is supervisor.

Howell Motors Building for National Stock

In the belief that trade in the electrical industry will be picking up in strong volume before long, the Howell (Mich.) Electric Motors Company is going ahead with production. For the past two months the company has been stocking motors at its distribution points, which now number about twenty-three large cities. On the first of January two carloads of motors were shipped for Pacific Coast stock. Arrangements have just been completed for warehouse facilities in New York City, where a full line of motors will be carried too. This is the first time that the company has ever been able to accumulate large stocks at its district sales offices, as heretofore production facilities were always far behind the volume of new business. Since the first of the year, when the plant closed down for the annual taking of inventory, departments have been gradually opening up, until at present production is at about 40 per cent of capacity. This is double what it was last month. The selling organization has been gradually built up since the first of last September, and for the past two months the company reports that the results have spoken for themselves.

Carload Order of Line Hardware Shipped in Two Hours

As an instance of quick shipments now ruling the American Jobbers' Supply Company, New York City, shipped a carload of pole-line hardware on Monday of this week within two hours after the order was received at the factory. The carload was sent to one of the largest New England electrical jobbing houses, which is evidently confident of a strong revival of business in this line. The American company is optimistic as to the future, too, as its hardware factory not only has accumulated a very large surplus stock, but is continuing to produce for the purpose of further building up its reserve supply.

Locke Gets Order for 220-Kv. Insulator Units

An order for 45,000 units of suspension-type insulators, similar to the No. 5800 type, has been received by the Locke Insulator Manufacturing Company, Victor, N. Y., from the Southern California Edison Company, Los Angeles. They will be used on an experimental section of transmission line approximately 20 miles in length for operation at 220,000 volts. The Southern California Edison Company is at present operating at 150,000 volts with nine suspension insulator units per string. The special engineering features involved in the use of these insulators, such as the hardware, the grading shields and the number of units used per string, are being worked out now by the power company's engineers in conjunction with Prof. H. J. Ryan of Leland Stanford, Jr., University. Delivery of the 45,000 units is to

be made during the coming summer. The Locke company is running at full capacity but is still from four to six months behind on orders. The company expects that new business during the present year will be received in sufficient volume to absorb capacity.

Reductions Made in Industrial and Power Apparatus

Following recent wage cuts of 10 and 15 per cent, depending on the class of work affected, put into force at the Schenectady works of the General Electric Company, there has been a general reduction of 10 per cent, effective Feb. 8, on certain classes of the company's apparatus. The following are covered: Alternating and direct current industrial motors (including welding apparatus), switchboards, regulators, rotary converters, motor generator sets and generators of all descriptions except turbo generators. Power transformers and turbines did not change. These changes are in list price, not in discounts, and new lists are being published.

The same change has been made by the Westinghouse Electric & Manufacturing Company, effective Feb. 9, on alternating and direct current industrial motors and motor generators.

Underwriters' Laboratories Make Few Changes in 1920

The Underwriters' Laboratories, Inc. 207 East Ohio Street, Chicago, in a recent publication states that there have been submitted rather fewer new patterns of the more general types of wiring devices during the past year but that an increasing number and variety of special electrical appliances for use either in homes or in factories have received attention. The year has not been marked by any radical changes either in standards for appliances or in the general types of devices under investigation.

The Laboratories' standard for nonmetallic tubing has been revised and improved. New standards have been issued on asbestos-covered heater cords and on varnished-cloth-insulated wires and cables, and numerous minor changes have been made in other electrical standards. The important work on inspections of rubber-covered wires and cords has continued virtually as in previous years, and the only changes in specifications and standards have been in the recognition of varnished-cloth insulation and in certain new types as now authorized by the 1920 National Electrical Code.

Mulliner Brothers, 445 South Warren Street, Syracuse, N. Y., manufacturing service engineers, have published "Human Engineering," by Richard Mulliner, a textbook for manufacturers, engineers, executives, managers, superintendents or students of the human element in manufacturing and business engineering.

The C. L. Warrick Company, electric lamp specialist, announces that it is now in its new quarters at 112 West Forty-second Street, New York City, where it has much larger space.

The Cincinnati Artistic Wrought Iron Works, 2941 Eastern Avenue, Cincinnati, manufacturer of portable lamps, etc., has established new sales offices at 500 Fifth Avenue and 19 West Twenty-fifth Street, New York City, and at 17 West Wabash Avenue, Chicago.

The Cleveland Belting & Machinery Company, 1504-24 University Road, Cleveland, manufacturer of engines and boilers, generators, motors and belting, has enlarged its storage space by an addition 65 x 320 ft. The company says that its business is beginning to improve and expects it will continue to increase from now on.

The Hertner Electric & Manufacturing Company, 1905 West 114th Street, Cleveland, contemplates the construction of a one-story factory, to cost about $60,000.

The Maille Electric Company, Providence, R. I., has removed from 24 Garnet Street to Fountain and Dean Streets, where it has larger quarters.

The Corning Glass Works, Inc., Corning, N. Y., has made arrangements for an issue of $3,000,000 in capital stock, the proceeds to be used for general financing and for proposed plant extensions.

Leo Offenberg, Inc., has purchased the building at 390 Canal Street, New York City, and will occupy the store, basement and first two floors, comprising about 6,000 ft. of floor space. The company plans to conduct an electrical jobbing business, selling at wholesale only.

The Tubular Woven Wire Fabric Company, Pawtucket, R. I., has removed its New York office from 61 Broadway to 52 Vanderbilt Avenue. This change was made necessary because of the sale of "Duraduct" and "Duracord" having been combined under one sales organization. P. S. Klees has been engaged to take care of the combined sales in that territory.

The Clifton Manufacturing Company, Boston, has moved into offices in the new addition recently made to its plant at 63 Brookside Avenue. The portion of the old building made vacant by this change will be used for factory purposes. The company manufactures enamel and galvanized-steel conduits, insulating tapes and compounds and specialized rubber goods.

The Central Telephone & Electric Company, St. Louis, announces the removal of its headquarters from 310-12 North Eleventh Street to 2018-20 Locust Street, where it has much larger quarters.

The Thomas A. Edison Company, Inc., West Orange, N. J., has filed notice of increase in capital stock from $2,000,000 to $3,000,000.

The Maintenance Company, 417 Canal Street, New York City, electrical contracting engineer, has purchased the six-story loft building at 449-453 West Forty-second Street. The company, it is understood, will soon move into its news quarters.

The Air-Way Electric Appliance Corporation, Toledo, Ohio, has established a new factory branch office at 20 East Jackson Boulevard, Chicago, in charge of Leon Mayer, district sales manager. The company has made arrangements with the National Electric Heating Company, Ltd., 544 Queen Street East, Toronto, to act as its exclusive factory distributer for Canada. A. L. Hixson has been appointed district sales manager for the states of Indiana and Michigan. J. H. Maish is district sales manager of Kentucky and Ohio.

The Palmer Bee Company, Cameron Avenue and East Grand Boulevard, Detroit, is preparing plans for a four-story factory on Poland Avenue, to cost, including machinery, in excess of $350,000. The company manufactures elevating and conveying machinery.

The Warner Electric Company, Kalamazoo, Mich., manufacturer of electrical equipment, has filed notice of increase in capital stock from $14,000 to $50,000.

The Electrical Engineering Manufacturing Company, Pittsburgh, has acquired space 40 ft. x 160 ft. for a local plant in the building at 928-30 Penn Avenue.

The Dayton Fan & Motor Company, Dayton, Ohio, is planning to increase its capital stock from 22,500 shares, no par value, to 67,500 shares, no par value, the proceeds to be used to retire an issue of $118,000 of preferred stock and to furnish additional working capital.

Western Electric Company salesmen in the territory for which Salt Lake City is headquarters held their semi-annual conference in that city on Jan. 20, 21 and 22. James S. Walker, Jr., president of the Salt Lake Electrical Contractor-Dealers' Association, spoke before the meeting on the 21st, and in the evening a dinner was given at the Newhouse Hotel. Talks were also given by C. H. Talmage, manager of the Salt Lake branch, and by several manufacturers' representatives.

The Dayton Insulating Die Company, Dayton, Ohio, manufacturer of dies and molded insulation, has been authorized to increase its capital stock from $10,000 to $100,000.

The Rutenber Electric Company, Marion, Ind., has filed notice of increase in capital stock from $150,000 to $250,000.

The Advance Electric Company, 6315 Maple Avenue, St. Louis, has decided to hold in abeyance temporarily the erection of its proposed one-story addition, 50 ft. x 100 ft., for the manufacture of electrical specialties.

The Smith-Perry Electrical Company, Dallas, Tex., has filed notice of increase in capital stock from $60,300 to $100,000.

The El Paso Battery & Ignition Company, El Paso, Tex., has increased its capital stock from $15,000 to $30,000.

Foreign Trade Notes

RECENT FOREIGN ENGINEERING STANDARDS. — Copies of engineering standards issued in 1920 by foreign national standardizing bodies are on file with the American Engineering Standards Committee, 29 West Thirty-ninth Street, New York City, or photostatic copies of these standards can be furnished at a nominal cost. The publications of the British Engineering Standards Associations include: No. 94, specifications for watertight glands for electric cables; No. 97, specifications for watertight fittings for incandescent electric lamps, and No. 106, specifications for electrically heated cooking range.

THE EDISON SWAN ELECTRIC COMPANY, in its report for the year ended June 30, 1920, published in a recent issue of the London *Electrical Times*, shows a profit of £111,570 for the year. It states that extensive additions have been made to the lamp works, mainly to provide for the manufacture of gas-filled lamps, at a cost of £91,169. The arrangements made with the Philips Glowlamp Works of Eindhoven, Holland, is also mentioned. By this agreement the company has been able to obtain the co-operation of that firm at the company's works at Ponders End in the manufacture of all classes of electric lamps. Under the agreement a separate company has been formed, to be known as the Ediswan Lamp-works, Ltd., for the entire manufacture of electric lamps for the company, the necessary capital being equally contributed by the Edison Swan company and the Philips company. The Edison Swan company has also made arrangements with the Sangamo Electric Company of the United States, and a company is being formed, the capital being subscribed by both firms, to manufacture meters at the Ponders End plant, buildings having been erected for the purpose at a cost of £25,000. Owing to the war, stocks of raw materials and manufactured goods have fallen very low. In order to increase these considerably, additional capital is necessary, and the shareholders are to be asked to sanction this. The issue is to be made as soon as the money market becomes more favorable.

DEMAND FOR SMALL MOTORS IN CANADA.—The demand for electrical appliances and accessories in Canada has been fairly good, particularly for small motors up to 1 hp. To meet this demand many manufacturers are now devoting special attention to the production of such motors.

NEW ZEALAND TO STANDARDIZE ELECTRIC DEVELOPMENT.—The New Zealand govrnment, it is reported, proposes to standardize the entire electric development of the Dominion on the standard three-phase, 50-cycle system. All new electric installations are to be made on this system, and several of the old plants are being changed to that system so as to be ready to take the government supply. The plans provide that the hydro-electric and steam-power plants are to be connected up on this system in each island when fully developed. The proposed hydro-electric developments in the North Island amount to 341,000 hp., with equal possibilities in the South Island. The cost of the North Island scheme is estimated at about $50,000,000 and that of the South Island plan at not much less.

WATER-POWER DEVELOPMENT IN SWITZERLAND. — Owing to the scarcity and high price of fuel in Switzerland plans have been hastened to utilize the water-power resources of the country. The maximum output of the power plants already existing near the rivers to be canalized amounts to 290,000 hp. By the erection of new plants and extensions to existing plants this will be increased by 1,450,000 hp. The hydraulic power to be obtained from rivers in the lower Alps is not included in these figures. Substantial progress has been made in the electrification of the Swiss railways, despite the high cost of materials and labor. It is estimated that the electrification will not be completed until 1923, and the cost is placed at approximately $150,000,000.

AMALGAMATION OF SIEMENS' INTERESTS WITH THE RHINE-ELBE UNION.—Arrangements for amalgamating the Siemens & Halske Electricitäts-Gesellschaft of Berlin and the other Siemens interests with the Rhine-Elbe Union, one of Hugo Stinnes' trust creations, according to the London *Electrician*, have been approved by the shareholders of the Siemens-Halske Company. The capital stock of the Siemens & Halske Company will be increased to 260,000,000 marks by the issue of 130,000,000 preferred and 4,000,000 ordinary shares. It is expected that this consolidation will make the company independent of market fluctuations in raw materials and increase the company's technical and commercial efficiency.

NEW EQUIPMENT FOR ELECTRIC PLANT AT VALLETTA, MALTA. — The manager of the waterworks and electric lighting plant, in a recent report, states that the present generating plant is inadequate and that there is an increasing demand for service not only from localities where mains are laid, but also from outlying centers such as Robato, Zebbug, Curmi, Hamrum, Zeitun and Paula, from which more than 600 applications have been received. Main extensions will not be undertaken before the generating station can meet the heavier demand. It is hoped to place the order for a new generator very soon so as to enable the department to put the new plant in service during 1921.

HYDRO-ELECTRIC DEVELOPMENT IN NEW ZEALAND.—The New Zealand Minister of Public Works in his annual report to Parliament has announced a progressive hydro-electric power development scheme to cover the next few years. The project consists of a complete high-tension transmission system in both the North Island and the South Island, connecting up the different hydro-electric power centers with the many electric power board districts. The government proposes to construct only the hydro-electric stations and main transmission lines and substations from which the energy will be sold in bulk to the local power boards for distribution to the consumers. Under the proposed plan the local organizations will be solely responsible for the distribution of the power for private use

New Apparatus and Publications

INSULATING MATERIALS.—The Mica Insulator Company, Schenectady, N. Y., has issued catalog No. 85, covering its electrical insulating materials.

HOME LIGHTING PLANTS.—Fairbanks, Morse & Company, 30 Church Street, New York City, has issued bulletin H-248, describing the "One and a Half" and the "Three" home light plants manufactured by the company.

CONTROL.—"Development of Electricity in the Merchant Marine" is the title of publication No. 890, recently issued by The Cutler-Hammer Manufacturing Company, Milwaukee.

ELECTRIC CRANES AND HOISTS.—The Northern Engineering Works, Detroit, has issued general catalog No. 28, covering its electric traveling cranes, hoisting machinery, etc.

DIMMER SET.—The Cutler-Hammer Manufacturing Company, Milwaukee, has developed a portable dimmer box for traveling theatrical companies.

INSTRUMENTS. — The Westinghouse Electric & Manufacturing Company, has developed the type SX switchboard ammeters and voltmeters.

FURNACE.—The Majestic Electric Development Company, San Francisco, is marketing a little electric furnace of 100-watt capacity for dentists and those engaged in similar occupations.

SOCKET.—A new medium-base lighting reflector socket, catalog No. 4235, of the Bryant Electric Company, Bridgeport, Conn., is on the market.

STARTER.—A new inclosed automatic alternating-current motor starter is being marketed by the Cutler-Hammer Manufacturing Company, Milwaukee.

POWER-LINE RACK. — The France Foundry & Machine Company, Toledo, Ohio, has developed a portable power-line rack.

OUTLET BOX.—A new octagon-type outlet box for reinforced concrete construction has been put out by the Adapti Company, Cleveland, which is described in bulletin No. 106 G.

BATTERY HANDLE.—A lead-coated wire-type handle for storage batteries, No. 7-A, is a new product of the Mueller Electric Company, Cleveland.

PULVERIZED COAL.—Catalog No. 72 on "Pulverized Coal Equipment" has just been issued by the Fuller-Lehigh Company, Fullerton, Pa.

CONDUCTORS. — "Aluminum Electrical Conductors" is being distributed by the Aluminum Company of America, Pittsburgh, Pa.

HYDRAULIC VALVE.—The Larner-Johnson, Valve & Engineering Company, Philadelphia, has issued bulletin No. 2, descriptive of the Johnson hydraulic valve and differential surge tank.

LIGHTNING ARRESTER.—A vacuum-type lightning arrester for telegraph, telephone and signal circuits has been placed on the market by E. Jacobus, 79 Orange Street, Newark, N. J.

BATTERY TESTER. — The "Mac" storage-cell tester, catalog No. 25, has been put on the market by Metric Appliance Corporation, One Hundred and Thirty-third Street and Willow Avenue, New York City.

RADIATOR.—The Electric Heating & Manufacturing Company, Seattle, Wash., has developed an electric radiator in sizes from 600 watts to 10,000 watts.

New Incorporations

THE REIMERS ELECTRIC APPLIANCE COMPANY, New York City, has been incorporated by W. K. Tavender, D. Koppen and A. E. Reimers, 513 West Fiftieth Street, New York City. The company is capitalized at $60,000 and proposes to manufacture electrical equipment.

C. & H. MENZER, INC., New York City, has been chartered with a capital stock of $35,000 to manufacture electrical equipment and devices. The incorporators are C. Menzer, C. B. Bentz and W. A. Van Ness.

THE THOMPSON-DEGLER COMPANY, Clarksburg, W. Va., has been incorporated with a capital stock of $25,000 to manufacture electrical equipment. The incorporators are F. M. Thompson and H. M. Degler, both of Clarksburg, and L. F. Chalfant, Shinnston.

THE BILT-RITE EQUIPMENT COMPANY, Worcester, Mass., has been chartered with a capital stock of $150,000 to manufacture machine tools and electrical equipment. The officers are: Charles J. Jernberg, president, and Joseph T. Lord, 324 Highland Street, treasurer.

METZ & BOWLES, INC., 219 East Main Street, Clinton, Ill., has been incorporated by Herman and M. R. Metz and Edward J. Bowles. The company is capitalized at $25,000 and proposes to manufacture electrical equipment and metal products.

THE STANDARD ELECTRIC & SUPPLY COMPANY, Baltimore, has been incorporated with a capital stock of $50,000 to manufacture electrical supplies and equipment. The incorporators are Cheston M. Valentine, Chilton Ellett and John E. Martin, St. James Apartment, Center and Charles Streets.

THE AMERICOLITE COMPANY, New York City, has been incorporated by P. G. Moore, Jr., H. P. Whidden and R. M. Beard. The company is capitalized at $250,000 and proposes to manufacture electrical fixtures.

THE THORNTON TRANSFORMER COMPANY, New York City, has been incorporated by W. Brewster, H. C. Smith and G. A. Thornton, 30 Church Street. The company is capitalized at $50,000 and proposes to manufacture electrical transformer equipment and other products.

THE O-B ELECTRIC VEHICLES, INC., Brooklyn, N. Y., has been incorporated with a capital stock of $500,000 to manufacture electric automobiles and parts. The incorporators are: W. H. Bloom, W. J. Bergold and T. F. Baumann, 307 East Ninetieth Street, New York City.

THE SECURITY FIRE ALARM COMPANY, New York City, has been incorporated by L. Barone, L. Grasso and A. Forte, 300 East 122d Street. The company is capitalized at $100,000 and proposes to manufacture electrically operated alarm systems.

THE METER SERVICE CORPORATION, New York City, has been incorporated with a capital stock of $25,000 to manufacture electrical instruments and equipment. The incorporators are F. W. Douglas, S. A. Gafvert and G. E. Scobal, 1790 Broadway.

THE CENTRAL ELECTRICAL & HARDWARE COMPANY, Newark, N. J., has been incorporated by Francis Gonzalez and William C. Daly. The company is capitalized at $50,000 and proposes to manufacture electrical equipment and hardware specialties. Magne Kjellesvig, 539 Central Avenue, represents the company.

THE IDEAL ELECTRIC MANUFACTURING COMPANY, Newark N. J., has been incorporated with a capital stock of $50,000 to manufacture electrical appliances and devices. The incorporators are August and Joseph A. Harth, August Weinert, Jr., and Otto A. Stiefel, 156 Market Street.

THE EATON ELECTRIC FURNACE COMPANY, Taunton Mass., has been incorporated under the laws of the state of Massachusetts with a capital stock of $95,000. Hary B. Eaton, 3 Prospect Street, Taunton, is president and treasurer.

Record of Electrical Patents

Notes on United States Patents

(Issued Jan. 18, 1921)

1,365,898. TELEPHONE APPARATUS; Henry C. Egerton, Passaic, N. J. App. filed Jan. 8, 1918. Loud-speaking receiver.

1,365,926. RADIO INTERFERENCE PREVENTER; Tyng M. Libby, Tacoma, Wash. App. filed Oct. 21, 1919. For counteracting effect of interfering signals.

1,365,965. MAGNETIC SEPARATING APPARATUS; Charles G. Buchanan, Roseville, N. J. App. filed June 12, 1918. Pulley.

1,365,966. MAGNETIC PULLEY; Charles G. Buchanan, Newark, N. J. App. filed May 4, 1920. Separation apparatus.

1,365,972. TESTING ATTACHMENT FOR SPARK PLUGS; John E. Finn, Brooklyn, N. Y. App. filed Nov. 1, 1919. Variable gap.

1,365,977. RADIOTELEGRAPHY; Leonard F. Fuller, San Francisco, Cal. App. filed June 18, 1917. Arc radio transmitters.

1,365,978. ELECTRICAL IMMERSION HEATER; Albert J. Gallager, New York, N. Y. App. filed Oct. 18, 1919. Non-corrosive insulating material.

1,365,988. BATTERY HAND-LAMP; Carl Hambuechen, Belleville, Ill. App. filed Aug. 26, 1916. Improved switch.

1,366,010. ELECTRIC ACCUMULATOR; Emmanuel Lemaire, Mons, Belgium. App. filed June 9, 1918. High capacity with small volume.

1,366,024. CALL-REGISTERING ATTACHMENT FOR TELEPHONES; Abraham Reubenstone, New York, N. Y. App. filed June 11, 1919. To prevent overcharges.

1,366,057. APPARATUS FOR CONVERTING ALTERNATING ELECTRIC CURRENTS INTO DIRECT CURRENTS AND VICE VERSA; John E. Calverley and William E. Highfield, Preston, England. App. filed March 26, 1920. Transformers and commutators.

1,366,069. MEANS FOR PREVENTING OFFSET IN PRINTING; James E. Doyle, Cleveland, Ohio. App. filed Aug. 17, 1918. Preventing offset and static electricity.

1,366,070. STORAGE BATTERY; John M. Friss, Racine, Wis. App. filed March 5, 1920. To prevent plates coming into contact.

1,366,073. ELECTRODE-ADJUSTING MEANS; Charles W. Harper, Chicago, Ill. App. filed April 29, 1920. Electrical furnace.

1,366,078. METHOD OF LOCATING FAULTY SUSPENSION INSULATORS ON LIVE-WIRE TRANSMISSION LINES; Tomlinson F. Johnson, Jr., Atlanta, Ga. App. filed March 16, 1918. By intensity of arc from insulator cap to metal point on an insulated pole.

1,366,084. PORTABLE HAND LAMP; Harry M. Koretzky, Brooklyn, N. Y. App. filed Aug. 5, 1919. Simple arrangement.

1,366,090. SEPARATOR FOR ELECTROLYTIC CELLS; Isaac H. Levin, New York, N. Y. App. filed April 21, 1919. Electrolyte permitted to circulate freely.

1,366,093. ELECTRIC LIGHT CLUSTER; Harold C. Noe, East Orange, N. J. App. filed May 20, 1920. For table lamps, etc.

1,366,095. VOLTAIC CELL AND ELECTRODE; Frederick R. Parker, Chicago, Ill. App. filed May 8, 1916.

1,366,108. VALVE WELDING; Fred H. Wobig, Detroit, Mich. App. filed March 6, 1920. Eliminates counter-boring.

1,366,141. CONTROL SYSTEM AND APPARATUS; Charles C. Whittaker, Pittsburgh, Pa. App. filed Feb. 13, 1920. Electric locomotives.

1,366,142. MINE TROLLEY; Robert G. Wilson, Davis, W. Va. App. filed Jan. 21, 1920. Readily reversible.

1,366,160. ROTARY SPARK GAP; August J. Kloneck, New York, N. Y. App. filed May 8, 1916. High frequency.

1,366,189. REELING DEVICE; Frank A. Klohs, Mansfield, Ohio. App. filed March 28, 1919. Trolley retriever.

1,366,191. DRY-CELL BATTERY; Harry M. Koretzky and Boris H. Teitelbaum, Brooklyn, N. Y. App. filed Dec. 17, 1919. Compact form.

1,366,196. ELECTRIC HAIR SINGER; Joseph P. McMahon, New York, N. Y. App. filed Jan. 30, 1920. Electrically heated wire.

1,366,198. REELING DEVICE; Samuel S. Matthews, Mansfield, Ohio. App. filed April 9, 1919. Trolley retriever.

1,366,199. REELING DEVICE; Samuel S. Matthews, Mansfield, Ohio. App. filed April 9, 1919. Trolley retriever.

1,366,215. SUPPLEMENTARY POWER PLANT FOR ELECTRIC CENTRALS; Johannes K. Ruths, Djursholm, Sweden. App. filed Aug. 5, 1916. Reserve generator for instant connection to load.

1,366,222. IGNITION MAGNETO FOR INTERNAL-COMBUSTION ENGINES; Ettore Viani, Milan, Italy. App. filed Aug. 19, 1919. Timing conveniently adjusted.

1,366,223. STORAGE BATTERY; Ralph W. Wales, Auburndale, Mass. App. filed Feb. 24, 1920. Improved separator.

1,366,231. STERLIZABLE CAUTERY; William A. Winter, East Orange, N. J. App. filed Sept. 8, 1917. Surgical instrument.

1,366,246. ELECTRIC SOCKET BOX; Abraham Cooper, Brooklyn, N. Y. App. filed April 7, 1919. For classification plugs, markers and signal lamps.

1,366,257. MEANS FOR MOUNTING ELECTRODES EMPLOYED IN THE PREVENTION OF CORROSION IN STEAM BOILERS, CONDENSERS AND LIKE STRUCTURES; Arthur S. Gush, Edinburgh, Scotland. App. filed Nov. 26, 1919. Insulating bushing.

1,366,263. SPEED-LIMITING DEVICE; James B. Replogle, Detroit, Mich. App. filed Dec. 16, 1918. For automotive vehicles.

1,366,298. DRY BATTERY; Boris H. Teitelbaum, Brooklyn, N. Y. App. filed Dec. 3, 1919. Valve to allow escape of ammonia.

1,366,311. PRODUCTION OF HIGH-FREQUENCY OSCILLATIONS; Fulton Cutting, Tuxedo Park, N. Y. App. filed June 26, 1918. Wireless telegraphy.

(Issued Jan. 25, 1921)

1,366,352. PROPELLING AND BRAKING MEANS FOR TRAVELING CRANES AND CARRIAGES; Melvin B. Benson, Superior, Wis. App. filed Oct. 28, 1918.

1,366,378. TROLLEY WHEEL AND HARP; William R. Gillies, Chicago, Ill. App. filed Nov. 20, 1919. Removable rim.

1,366,395. RECTIFIER; Oscar M. Leich, Genoa, Ill. App. filed March 24, 1919. Vibratory.

1,366,404. ELECTRODE; Archibald J. MacDougall, Toronto, Ontario, Canada. App. filed July 2, 1919. Electrolytic apparatus.

1,366,410. TRANSMITTER; Marshall R. Myers, Afton, Ia. App. filed Dec. 22, 1919. Wireless.

1,366,411. THERMIONIC TRANSLATING DEVICE; Alexander McL. Nicolson, New York, N. Y. App. filed Feb. 19, 1916. Vacuum tube.

1,366,414. MEANS FOR AND METHOD OF MEASURING WEAK CURRENTS; Harold S. Osborne and William H. Martin, New York, N. Y. App. filed Feb. 26, 1917. In telephone circuits.

1,366,416. SIGNALING SYSTEM; Harry Pfannenstiehl, East Orange, N. J. App. filed June 18, 1917. Printing telegraph.

1,366,423. COMPOSITE RINGER; Roy B. Shanck, Kingston, N. Y. App. filed May 21, 1919. Telephone and telegraph.

1,366,446. METHOD OF AND APPARATUS FOR THE REPRODUCTION OF SOUNDS AND MOTIONS; Lee A. Collins, Louisville, Ky. App. filed May 26, 1917. Simultaneous reproduction of sound and picture.

1,366,452. VAPOR RECTIFIER FOR HIGH-POTENTIAL CURRENTS; George W. Heimrod, Hanover, Germany. App. filed June 3, 1914. High potential.

1,366,457. APPARATUS FOR CALCINING CARBON FOR ELECTRODES; William Hoopes, Pittsburgh, Pa. App. filed May 20, 1919. To produce coke of high grade.

1,366,458. METHOD OF CALCINING CARBON FOR ELECTRODES; William Hoopes, Pittsburgh, Pa. App. filed May 20, 1919. To produce coke of high quality.

1,366,461. FLASHLIGHT; Gustaf I. Johnson, Malden, Mass. App. filed Oct. 23, 1919. Manually generates current.

1,366,475. APPARATUS FOR THE PRODUCTION OF ALTERNATING CURRENTS; John L. Milton, Cleveland, Ohio. App. filed Jan. 30, 1909. For ignition.

1,366,478. POWER SYSTEM; William Morrison, Chicago, Ill. App. filed Sept. 7, 1916. Automobile.

1,366,480. ELECTRIC IRON; Jose A. Oca-Balda, New York, N. Y. App. filed Oct. 7, 1919. Circuit opens short time after releasing handle.

1,366,489. PROCESS OF MAKING NEGATIVE ELECTRODES FOR ELECTRIC ACCUMULATORS; Adolfo Pouchain, Turin, Italy. App. filed Sept. 18, 1919. Plate coated with zinc.

1,366,490. NEGATIVE PLATE FOR ELECTRIC ACCUMULATORS; Adolfo Pouchain, Turin, Italy. App. filed June 22, 1920. Zinc plate reinforced by metal of high conductivity.

1,366,491. MANUFACTURE OF NEGATIVE PLATES FOR ELECTRIC ACCUMULATORS; Adolfo Pouchain, Turin, Italy. App. filed June 22, 1920. Two amalgamated zinc plates mounted on opposite faces of rigid material.

1,366,519. ELECTRIC HEATER; Samuel M. Carmean and James H. Carmean, Kansas City, Mo. App. filed March 13, 1920. Fan throws out hot air.

1,366,525. CORE STRUCTORE FOR DYNAMOS; William W. Dean, Rochester, N. Y. App. filed Aug. 4, 1916. Core in extended contact with the pole pieces.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

ROCKINGHAM, VT.—In connection with a proposed three-story dormitory the Vermont Academy, Saxtons River, Rockingham, plans to erect a 50-ft. x 50-ft. power house. The total cost will be about $100,000.

AMESBURY, MASS. — The Amesbury Electric Light Company has applied to the Department of Public Utilities for permission to issue stock for $60,000 to be used for extensions to its property.

BOSTON, MASS.—Plans have been filed by the John West Thread Company, 1342 Columbia Road, for improvements and alterations to its power house.

FRANKLIN, MASS.—The Union Light & Power Company has petitioned the Department of Public Utilities for permission to issue additional capital stock to the amount of $150,000. According to E. S. Hamblen, general manager, the new capital is needed for improvements and extensions to the plant.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company has filed plans for the construction of a three-story power house on Elm Street.

Middle Atlantic States

LE ROY, N. Y.—The Le Roy Hydraulic Electric Gas Company, having recently installed equipment at its plant for increased capacity, is considering the extension of its electric lines northward on the Lake Street Road. This extension would provide energy for light and power for Fort Hill, Stone Church and adjoining vicinity.

MECHANICSVILLE, N. Y. — The Half Moon Light, Heat & Power Company has increased its capital from $200,000 to $300,000 for proposed expansion.

NEW YORK, N. Y.—The Knickerbocker Ice Company, 481-99 West 184th Street, contemplates the installation of considerable electrical and mechanical equipment in the proposed addition to its ice manufacturing plant.

BELVIDERE, N. J.—Plans are under way by New York and Eastern capitalists, represented by P. T. Brady of the Westinghouse Electric and Manufacturing Company, for the development of a large power project on the Delaware River, including the construction of several reservoirs and dams. Four applications have been filed with the Federal Power Commission, and upon grant of federal consent work will be started immediately. The central electric power plant, using both steam and water power, which will probably be erected at Belvidere, is designed to generate 300,000 hp., though at first only half that power will be available. Twelve local and supplementary power houses will be erected along the Delaware Valley line at Hankins, Narrowsburg, Barryville, Mongaup, Eastbranch, N. Y., and Dingman's Ferry and Bushkill,

Pa. More than $1,000,000 has been expended for sites, surveys, plans and initial contracts. The total cost is estimated at about $100,000,000.

ELIZABETH, N. J. — The Bethlehem Shipbuilding Company, Front Street, has tentative plans under way for the construction of proposed additions and installation of electrical and mechanical equipment. The total cost is approximated at $1,000,000.

ERIE, PA.—The City Council has been petitioned for the installation of an ornamental lighting system on Peach Street from Fifteenth to Twenty-sixth Street. Mr. Eichhorn is street director.

MASONTOWN, PA.—The power house at the Patrick mine of the Nicholson Coal Company, it is reported, has been damaged by fire, causing a loss of about $25,000. It is understood that the power plant will be rebuilt.

MOUNT CARMEL, PA.—Plans have been approved by the Borough Council for the installation of a fire-alarm system.

FREDERICK, MD. — Plans are under way by the Nicodemus Ice Cream Company for the erection of a power house in connection with a three-story manufacturing plant. H. O. Nicodemus is president.

HAMPSTEAD, MD.—Bids are being received by the Carroll County School Board, Court House, Westminster, for the construction of a three-story electric light plant.

NORFOLK, VA. — An appropriation of $18,000,000 has been arranged by the Norfolk & Western Railway for extensions and improvements. Plans include the construction of a new power plant, general repair shops for locomotive work and the installation of electrical equipment, to cost about $1,000,000. Other installations of electrically operated machinery will also be made.

RICHMOND, VA.—Liggett & Myers, 212 Fifth Avenue, New York City, plan to install a turbine engine in connection with the generation of electricity at their new factory in Richmond.

FREMONT, OHIO. — The city officials contemplate changing the entire lighting system when the present contract expires this year.

GLENDALE, OHIO.—The village officials contemplate the electrification of the local water-works at a cost of about $30,000. Energy will be obtained from the Union Gas & Electric Company, Fourth and Plum Streets, Cincinnati.

SPRINGFIELD, OHIO.—The Springfield Light, Heat & Power Company will make improvements this year which will cost about $200,000. Plans include construction work, betterments to the distribution system and installation of automatic voltage regulators. C. I. Weaver is general manager.

WAPAKONETA, OHIO.—At a recent election bonds to the amount of $110,000 were voted for rebuilding the municipal light plant.

HAZARD, KY. — The Hazard Light & Power Company plans to make improvements this year at a cost of about $15,000. New equipment will be required.

DELPHI, IND.—The Farmers' Co-operative Packing Company contemplates the erection of a packing plant, power house, etc., to cost about $500,000.

FRANKFORT, IND.—Specifications have been prepared and bids will soon be received for the erection of a municipal light and power plant and the installation of equipment including turbines, condensers, boilers, etc. The cost is estimated at about $275,000. J. D. Lyon, Union Central Building, Cincinnati, Ohio, is engineer.

RICHMOND, IND. — The city officials have had specifications prepared for a 5,000-kw. alternating-current light plant to cost about $175,000. A centrifugal pump, coal and ash handling equipment, meters, etc., will be installed at a cost of $50,000. J. D. Lyon, Union Central Building, Cincinnati, Ohio, is engineer.

GALESBURG, ILL.—The Board of Local Improvements is considering the installation of an ornamental lighting system on Jefferson Street.

BELOIT, WIS.—The County Board has granted the Beloit Water, Gas & Electric Company permission to extend its line to the township of Turtle.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs Water, Gas & Electric Company plans to erect a transmission line to Liberty.

WARRENSBURG, MO.—The city officials contemplate the erection of a 12-mile distribution system in the city and an 8-mile transmission line outside. F. L. Wilcox, Syndicate Trust Building, St. Louis, is consulting engineer.

CASTLEWOOD, S. D.—A special election will be held Feb. 15 to submit to the voters a proposition to issue $18,000 in bonds for the installation of a municipal light plant.

OSCEOLA, NEB.—The City Council has requested an estimate on a municipal light plant.

WALES, TENN.—The International Agricultural Corporation contemplates the electrification of its plant at a cost of more than $300,000. Electric motors and considerable electrically operated equipment will be installed at this plant for fertilizer production. Plans also include the erection of 20 miles of 6,600-volt transmission line and a step-down transformer station. J. A. Barr, Mount Pleasant, is engineer.

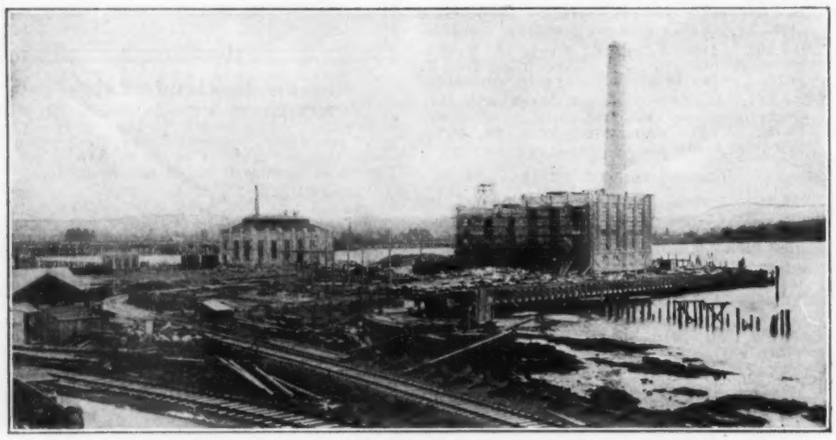
MONROE, LA.—The Union Power Company, St. Cloud, Minn., contemplates the erection of an electric plant in the Monroe gas fields.

DUNCAN, OKLA.—An election will be held soon for the purpose of submitting to the voters the proposal to issue bonds for the establishment of a light and power plant.

DALLAS, TEX.—The Board of Commissioners has granted the Dallas Power & Light Company permission to install three new power feeders at its East Dallas substation and three at its main station. The cost is estimated at $12,553.

MEMPHIS, TEX.—The city officials have purchased a light and ice plant and contemplate enlargements.

SOUTH BEND, TEX.—The Prairie Pipe Line Company is having plans prepared for a new electrically operated pumping plant to cost about $45,000.



CONSTRUCTION WORK ON NEW STEAM STATION AND GAS PLANT AT ASTORIA BY PHOENIX UTILITY COMPANY FOR PACIFIC POWER & LIGHT COMPANY

North Central States

ADA, MICH.—H. G. D. Nutting, an engineer at Grand Rapids, has been granted permit for the construction of a 24-ft. dam capable of developing about 1,000 hp.

HOUGHTON, MICH. — The Bureau of Yards and Docks, Navy Department, Washington, D. C., contemplates the erection of a radio building at this place.

PELLSTON, MICH. — The Cheboygan Electric Light & Power Company's dam, near Pellston, will be entirely rebuilt. Plans include the installation of waterwheels and electric generating equipment for control by means of electric energy from substation at Pellston. The present plant at the dam will be discarded.

TRAVERSE CITY, MICH.—An election will be held April 4 for the purpose of submitting to the voters a proposition to issue $250,000 in bonds for the installation of a hydro-electric plant. Mr. Moffatt is city clerk.

CLEVELAND, OHIO.—Bids will be received by the Board of Education until Feb. 28 for furnishing electric wiring, fixtures and reflectors for Mayflower, St. Clair and Dunham Schools. W. R. McCormack, East Sixth Street and Rockwell Avenue, is architect.

Southern States

GAFFEY, S. C.—The Cherokee County Home contemplates the installation of a light and water system.

PUNTA GORDA, FLA.—The installation of a street-lighting system at this place is contemplated.

Pacific and Mountain States

PRIEST RAPIDS, WASH.—At a recent conference attended by residents of Portland, Spokane, Seattle and several other places the proposition to erect the Priest Rapids dam and develop a large power plant was approved. Colonel Schultz represented the war department.

SEATTLE, WASH.—The Board of Public Works will receive bids until Feb. 15 for furnishing electrical equipment, including two 35,000-hp. generators, exciters, etc., for the Skagit River project. The cost is estimated at about $1,000,000.

DUARTE, CAL.—The Jewish Consumptive Relief Association contemplates the erection of hospital buildings and a power plant to cost about $100,000. F. H. Wallis, 507 Title Insurance Building, Los Angeles, is architect.

LODI, CAL.—The installation of additional equipment at the municipal light plant to cost about $20,000 is under consideration.

LOMPOC, CAL.—The San Joaquin Light & Power Company, Fresno, plans to extend its line to this section.

SACRAMENTO, CAL.—A report approving plans for the Iron Canyon irrigation project and prepared by the United States Reclamation Service and the State Engineering Department was submitted at a recent meeting of the Sacramento Valley Development Association. Plans include the construction of a hydro-electric plant and also a dam to impound water sufficient to irrigate 225,000 acres of land at a cost of $15,000,000. The total estimated cost is $37,577,932. W. F. McClure is state engineer.

BOISE, IDAHO.—The City Council has applied to the Federal Power Commission for permission to erect a 75-ft. dam on the north fork of the Payette River and to develop 12,000 hp. for municipal use.

PROVO, UTAH. — The Keeler Electric Light Company, recently incorporated for $5,000, plans to operate an electric light and power line in the vicinity of Salem and Spanish Fork. J. A. Walter is president and director.

SALT LAKE CITY, UTAH.—R. H. Lehman of Salt Lake City has filed application with the state engineer for the diversion of 20 sec.-ft. of water from Salina Creek in Sevier County. The development of 600 hp. for a coal mine in Salina Canyon is contemplated.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has applied to the Federal Power Commission for permission to erect a 250-ft. dam on the Green River in southeastern Utah. The construction of an 8,000-hp. plant is also proposed for serving power in the vicinity of Salt Lake City and parts of Wyoming

TRENTON, UTAH.—The Utah Power & Light Company, Salt Lake City, has been granted a certificate of convenience and necessity to construct, operate and maintain a light and power system in and adjoining the town of Trenton.

Canada

GALT, ONT.—The Hydro-Electric Commission is considering the establishment of a hydro-electric system in Galt similar to the one in Chatham.